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17. ABSTRACT (MAX. 250 WORDS)

Biology: Life Science is geared to students of average ability; Biology: General is intended for students planning to go to college. Biology: Advanced Placement is offered for those who have completed Biology: General in grades 10 or 11 and who wish to pursue college level study while in grade 12.

The non-technical Biology: Life Science has outlined units in organizing food, organ systems, health, continuance of life, past, present and future of life, and some biological problems of man. Laboratory work should be well planned. A sample test and suggested texts, references and audio-visual aids are included.

The Biology: General course covers essentially the same course of study as the adopted course but with much greater depth and uses a more technical vocabulary. Extensive units in the plant and animal kingdoms, reproduction, nutrition, and genetics are included.

The advanced placement course for highly able students is highly technical in nature and includes a great deal of laboratory work. Background in biology and chemistry is essential. Test suggestions are given in addition to suggested texts, references, and audio-visual aids.

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CURRICULUM GUIDES

in

BIOLOGY: LIFE SCIENCE
BIOLOGY: GENERAL
✓BIOLOGY: ADVANCED PLACEMENT

SECONDARY CURRICULUM
BULLETIN NO. 111

KANSAS CITY, MISSOURI
PUBLIC SCHOOLS
1961

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U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
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INTRODUCTION

A tentative three-level biology curriculum has been designed to meet in a more effective way the needs and interest of students in our secondary schools. The committee has endeavored to build curriculum by levels which will not only provide an excellent academic background for advanced science study in college but will also provide functional learning experiences for those who will terminate their education in the secondary school.

The study of biology is to enable students to better understand the life processes of plants and animals in our environment and to provide a better understanding of ourselves as human beings. The courses emphasize the methods of science in solving problems and contribute to the development of scientific thinking of the student, as a part of a continuous program of science offered in the elementary and secondary schools of the Kansas City, Missouri, public schools.

In counseling the pupils into the various courses offered, every effort should be made to place the student in the appropriate course to meet his specific needs. Those enrolling for Biology: Life Science, should be students needing the more functional aspects of biology; while Biology: General should be taken by students planning to go on to more advanced work in college. Biology: Advanced Placement is offered for those who have completed Biology: General in grades 10 or 11 and who wish to pursue advanced study while in high school in grade 12. This course may be taken for advanced placement or for advanced college credit at the discretion of the college attended.

The committee hopes that as teachers use the biology curriculum they will consider it as a tentative construction and that all will seek to improve and keep its content current. Its modification from time to time is imperative if we are to meet the challenge of the world of science.

BIOLOGY: LIFE SCIENCE

OVERVIEW

Biology: Life Science is a functional non-technical course designed to meet the needs and interests of the pupil who lacks the academic background and reading ability to pursue the general biology course. Its purpose is to provide the pupil with basic biological facts and information needed by all pupils, but it avoids the technical vocabulary and laboratory techniques used in general biology.

The following learning areas and problems are given extensive development; how the body works, how we keep alive, what happens to the food we eat, how we breathe, how the body helps fight germs, why we look like our ancestors, how we live longer and healthier lives, and what some of the problems are which we must solve in order that we may survive.

It is the hope that this treatment of the biological materials will provide many worthwhile learning experiences for the pupil terminating his education at the high school level.

GENERAL OBJECTIVES

To develop scientific attitudes, methods, and skills.

To develop understandings of some of the fundametal biological principles and facts.

To inculcate interests in recreational and avocational biology.

To establish functional understandings of some social and economic implications and applications of biology.

To meet apparent needs of the pupil and to arouse an abiding interest in biological problems.

To stimulate appreciation of the beauty of nature.

SPECIFIC OBJECTIVES

To acquaint the pupils with the science of biology, the methods, and tools used by the biologist and the organisms studied by him.

To stimulate the pupil's interests in recreational, avocational, and aesthetic phases of biology.

To help pupils develop functional understandings of human anatomy, physiology, and behavior.

To make pupils aware of major food problems confronting the individual, the nation, and the world.

To develop in pupils proper attitudes leading to the wise selection and utilization of available foods.

To help pupils establish desirable behavior patterns through functional understanding of organisms.

To help pupils understand the causes of different kinds of diseases so that each one may protect himself and his community from these enemies.

To help pupils understand that reproduction is a precess necessary for the continuity of the species.

To help pupils develpp a general knowledge of phylogeny and ontogeny, culminating in mammalien reproduction.

To help pupils establish a general understanding of the basic processes and principles involved in reproduction and heredity.

To help pupils realize that scientific breeding of plants and animals is an important outcome of genetics.

To inculcate in the pupils attitudes leading to the support of all desirable conservation measures.

METHODS, PROCEDURES AND TECHNIQUES

This course in Biology: Life Science is made to fit the special needs and interests of students who may be lacking in certain abilities necessary to understand a more advanced course in biology. The teacher should always keep in mind that simplicity in prodedures, class discussions, and terminology is of greatest importance in developing the possibilities of these students.

To most of the pupils taking this course it will be a terminal course. Because of this fact, the teacher should use every opportunity to instill the child with an appreciation for the beauties of nature and an appreciation of biology as related to the city, state, and nation.

Teachers of this course should plan the day's work well in advance and fit it to the abilities of these students, especially at first. The teachers, however, should make careful and difinite daily assignments, which the pupil should study under the direct supervision of the teacher. As the daily assignment progresses, the teacher should explain meanings and terminology in the course and any other parts that may be seemingly difficult.

The units of the course and their sub-divisions are reduced for simplicity, and the vocabulary included is non-technical in so far as is possible. Should a teacher discover a pupil, or pupils, capable of using more technical terms, then the teacher may adjust the vocabulary as he desires.

At times group discussions, under the guidance of the teacher, will be advisable Laboratory procedures should be carefully planned in advance. Demonstration microscopes should be used rather than allowing their indiscriminate use by pupils. In so far as is possible, student help in performing experiments is recommended. All activities of the class should be made as interesting as possible to each member of the class. One way to create interest is to include pupil participation wherever possible. The training of a future biologist is not the primary purpose of this course. It is rather to aid all students to find their place in society through biology.

OUTLINE OF COURSE

Unit 1. Introduction

I. A general survey of the human organism

  A. Structures - bones, teeth, muscles, heart, blood, eyes, ears, stomach, kidneys, lungs, nerves, brain, skin, hair, nails, hahds, and feet
  B. Functions - breathing, eating, excreting, and reacting

II. A general survey of cells

  A. Plant
    1. Parts - wall, membrane, cytoplasm, and nucleus
    2. Shapes and sizes
  B. Animal
    1. Parts - membrane, cytoplasm, and nucleus
    2. Shapes and sizes

III. A general survey of tissues - covering, supporting, glandular, nervous, muscular, and blood

IV. A general survey of protoplasm

  A. Examples - in the paramecium and amoeba
  B. Composition - elements and compounds

Vocabulary and Terms

ameba
biology
blood vessel
breathe
capillary
cell
cytoplasm
excretion
false foot
germ
hand lens
nucleus
organism
oxygen
pulse
scientist
skeleton
sense organ
tissue
wastes
cell membrane
covering tissue
life process
slipper animal
supporting tissue

Unit 2. Getting Acquainted with some Organisms

I. More familiar ones

  A. Seed plants
    1. Flowering
      a. Uses to man - food, clothing, shelter
      b. Characteristics - root, stem, leaf, flower, seed
      c. Examples
        (1) Living specimens
        (2) Collections - flowers of cultivated plants, seeds, leaves of trees and shrubs, grasses, weeds, twigs, barks
        (3) Pictures
    2. Cone-bearing
      a. Uses to man
      b. Characteristics - root, stem, leaf, cone, seed
      c. Examples
        (1) Living specimens
        (2) Collections - cones, leaves
        (3) Pictures

Unit 2. Getting Acquainted with some Organisms (Continued)

- B. Insects
  - 1. Characteristics
    - a. Parts
      - (1) Head - eyes, feelers, mouth
      - (2) Thorax - wings, legs
      - (3) Abdomen - breathing openings
    - b. Size
    - c. Stages in development - egg, larva, pupa, adult
  - 2. Activities
    - a. Beneficial to man - pollination of flowers, making honey, beeswax, silk, shellac, dyes, destroy other insects harmful to man
    - b. Harmful to man - destroying crop plants, stored food, clothing, trees and shrubs; carrying disease germs; biting and injuring man and his domesticated animals
  - 3. Examples - living specimens, collections, pictures
- C. Vertebrates
  - 1. Characteristics
    - a. The backbone
      - (1) Parts - vertebras, discs
      - (2) Work
    - b. The organs used in breathing - gills and lungs
  - 2. Main groups - fish, amphibians, reptiles, birds, mammals
  - 3. Examples - living specimens, collections, pictures

II. Less familiar ones

- A. Animals - wheel animal, stentor, vorticella
- B. Plants
  - 1. With chlorophyll - spirogyra, Pleurococcus, diatoms, seaweeds, elodea
  - 2. Without chlorophyll - bacteria, yeast, mold, mildew, mushroom, puffball

III. General survey of the two kingdoms

- A. Animal
- B. Plant

IV. Food factories - green leaves

- A. Parts
  - 1. External - stem, blade, veins
  - 2. Internal - epidermis, stomata, guard cells, palisade layer, spongy layer, veins, chloroplasts, cells
- B. Function - making glucose
  - 1. Energy used
  - 2. Raw materials used
  - 3. By product produced
- C. Products made from glucose - complex sugar, starch, fats, oils, proteins, cellulose

V. Food users

- A. In food chains

Unit 2. Getting Acquainted with some Organisms (Continued)

B. In partnership
C. In parasitism - protozoans, flatworms, roundworms, insects and relatives, and fungi
D. In saprophytic relation - some mushrooms, molds, mildews, bacteria

Vocabulary and Terms

algae
carbohydrate
chlorophyll
culture
diatom
energy
fertilization
fungi
glucose
host
hydra
jellyfish
maggot
mammal
microorganism
oxidation
parasite
pistil
pollen
pollination
spirogyra
stamen
symbiosis
trichina
vertebrate
carbon dioxide
food chain
pond scum
seed plant
sexual reproduction

Unit 3. Food

I. Kinds and uses

A. Carbohydrates - sugar, starch
B. Fats and oils
C. Proteins
D. Vitamins - thiamin, riboflavin, niacin, A, C, D
E. Minerals - calcium, phosphorus, iron, iodine
F. Water

II. Diet

A. Basic seven
B. Calories needed

Vocabulary and Terms

allergic
appendix
Calorie or great calorie
digestion
gall bladder
gall stones
gullet
hemoglobin
minerals
protein
scurvy
vitamins
amino acids
building foods
energy food
gastric juice
large intestine
night blindness
salivary glands
small intestine

Unit 4. Body Systems of Organs

I. In the frog

A. Digestive - major parts and functions
1. Mouth - tongue, teeth
2. Gullet
3. Stomach
4. Intestines - small, large
5. Pancreas
6. Liver and gall bladder

B. Respiratory - major parts and functions
1. Mouth - nostrils, vocal sacs, voice box
2. Lungs
3. Skin

C. Circulatory - major parts and functions
1. Heart
2. Arteries

Unit 4. Body Systems of Organs (Continued)

  3. Veins
  4. Capillaries
D. Excretory - major parts and functions
  1. Kidneys and bladder
  2. Large intestine and anus
E. Nervous - major parts and functions
  1. Brain - cerebrum, cerebellum, medulla
  2. Spinal cord
  3. Sense organs - eyes, ears

II. In man

A. Digestive - major parts and functions
  1. Mouth - teeth, tongue, salivary glands
  2. Gullet
  3. Stomach and gastric glands
  4. Intestines
    a. Small - glands, finger-like projections
    b. Large
  5. Liver and gall bladder
  6. Pancreas
  7. Appendix
B. Respiratory - major parts and functions
  1. Nostrils
  2. Windpipe - epiglottis, voice box, vocal cords, rings of cartilage
  3. Lungs - air sacs, blood cappillaries
C. Circulatory
  1. Heart - auricles, ventricles, valves
  2. Tubes - arteries, veins, capillaries
  3. Spleen and liver
  4. Blood - cells, liquid
D. Muscular - major parts and functions
  1. Voluntary (striated) - cell, tendon
  2. Involuntary (smooth)
E. Skeletal - major parts and functions
  1. Bones of skull - cranium, jaws
  2. Bones of trunk - vertebra, spinal column, ribs, breastbone, collar bone, hipbone, shoulder blade
  3. Bones of arms and legs - upper arm, lower arm, wrist, hand, upper leg, lower leg, knee cap, ankle, foot
  4. Joints
  5. Ligaments and cartilages
F. Excretory - major parts and functions
  1. Kidneys - capsule, capillary, collecting tube
  2. Bladder and ureter
  3. Skin - epidermis, dermis, glands, hairs, nerve endings
E. Nervous - major parts and functions
  1. Central (Brain) - cerebrum, cerebellum, medulla, branching nerves; spinal cord and branching nerves
  2. Autonomic - nerve, nerve cells
  3. Sense organs
    a. Nerve endings in the skin
    b. Nerve endings of smell
    c. Taste buds

Unit 4. Body Systems of Organs (Continued)

- d. Ear
  - (1) Outer - drum, canal
  - (2) Middle - bones, eustachian tube
  - (3) Inner
- e. Eye - retina, optic nerve, blind spot, lens, pupil, iris

Vocabulary and Terms

balance sense organ
abdomen
artery
auricles
bladder
cartilage
blind spot
cerebellum
cerebrum
diaphragm
epidermis
evaporation
cranial nerves
central operators
kidney
medula
organ
vein
voice box
iris
ventricles
windpipe
hinge joint
optic lobes
optic nerve
spinal nerves
lens
skeletal muscles
spinal cord
vocal cords
pupil
retina

Unit 5. Behavior

- I. Nature
  - A. Factors - stimuli, responses
  - B. Kinds - voluntary, involuntary
  - C. Structures involved
    - 1. Nervous system
    - 2. Ductless glands
      - a. Adrenal - adrenalin, cortisone
      - b. Intestinal
      - c. Pituitary
      - d. Thyroid
      - e. Parathyroids
      - f. Islands of the pancreas
      - g. Sex
- II. Control and change
  - A. Learning
  - B. Emotions
  - C. Habits - forming, breaking
  - D. Effects of drugs and stimulants

Vocabulary and Terms

adrenal
emotion
habit
hormone
metabolism
pituitary
reflex
stimulus
thyroid
conditioned reflex
color blindness

Unit 6. Health

- I. Diseases
  - A. Causes
    - 1. Germs
      - a. Kinds - worms, bacteria, viruses, protozoans, molds
      - b. Spread - direct contact, indirect contact, animal carriers
    - 2. Organic and functional
      - a. Degenerative
      - b. Allergy
      - c. Deficiency

Unit 6. Health (Continued)

- d. Mental disorder
- e. Drug addiction
- B. Control
  - 1. Body defenses
    - a. Skin
    - b. Blood- white cells, antibodies
    - c. Lymph nodes
    - d. Mucus
    - e. Hairs
    - f. Cilia
  - 2. Prevention
    - a. Inoculations
    - b. Habits
      - (1) Use of drugs and stimulants
      - (2) Physical - sleep, posture, eating
      - (3) Mental - attitudes, interests, activities
    - c. Warning signals - headache, chills, fever, sore throat, vomiting, dizziness
    - d. Services of doctors
    - e. First aid - serious injuries, small injuries
    - f. Public welfare
      - (1) Safe water supply
      - (2) Safe food supply - inspection, pasturization of milk
      - (3) Proper sewage and garbage disposal

II. Heroes - Louis Pasteur, Robert Koch, Edward Jenner, Walter Reed, Theobald Smith, Alexander Fleming, Edward Turdeau, Joseph Goldberger, Joseph Lister Jonas Salk

Vocabulary and Terms

anesthetic
antibodies
appendicitis
bacteria
cilia
contagious
coronary
depressant
first aid
immune
lymph
rabies
stimulant
vaccination
virus
lymph vessel
dislocated bone
artificial immunity
circulatory disease
habit forming drug
white blood cell

Unit 7. Continuance of Life

I. Reproductive processes

- A. In small organisms - animals, plants
- B. In insects
- C. In flowering plants
  - 1. Sexual - cross-pollination, self-pollination
  - 2. Asexual
- D. In vertebrates - fish, amphibians, reptiles, bifds, mammals

II. Inheritance in plants and animals

- A. Carriers of heredity - nucleus, chromosomes, gene
- B. Differences in genes - recessive, dominant
- C. Cell division - equal, reduction
- D. Mendel's discoveries
- E. Hybridizations and mutations
- F. Human traits

Unit 7. Continuance of Life (Continued)

III. Environmental influences

Vocabulary and Terms

albino
blending
bread mold
cell division
chromosome
complete flower
color blindness
dominant gene
embryo
environment
fertilized egg
gene
handicaps
hybrid
hydra bud
mold
mutation
mold
ovary
puff ball
pure
recessive gene
sex chromosome
spore
spore print
testis
variation
athlete's foot
bleeder's disease
cross-pollination
identical twin
perfect flower
reduction division

Unit 8. Pageant of Life

I. Past revealed by the fossils

- A. History of the earth
- B. Histories of living things
  - 1. Plants
  - 2. Animals
    - a. Horse
    - b. Elephant
    - c. Birds
    - d. Man - Java, Pekin, Heidelberg, Neanderthal, Cro-Magnon

II. Present

- A. Racial groups - Caucasoids, Mongoloids, Negroids
- B. Man's place among organisms - food-raiser, talker, tool-maker, builder problem-solver

III. Future - animals, plants

h.

Vocabulary and Terms

dawn horse
dinosaur
era
family tree
fossil
geologist
Homo sapiens
hybrid corn
Java Man
mammoth
principle
racial groups
radioactive
sediment
wasteland
wornout land
ancient bird
Cro-Magnon Man
one-toed grazer
scientific methods
sedimentary rock

Unit 9. Some Biological Problems of Man

I. Present - soil, water, forests, wild life, recreation

II. Future

- A. Food supply - plants, soil, animals, water
- B. Health - life span, radiations
- C. Space travel

Vocabulary and Terms

bounties
compost heap
conservation
erosion
humus
mineral resources
natural resources
nitrates
organic disease
runoff water
solar energy
soybeans
wildlife
balance of nature
flash flood
green plant manure
hardening of arteries
radiation sickness
rebuilding soils

TESTING AND EVALUATION

It is necessary to have an evaluation program to reveal the pupil's growth toward the selected goals. This program of appraisal has several obligations: first, to devise tests and measures that will reveal not only the mastery of facts and principles of a given area, but also a functional understanding of concepts and generalizations involved; second, to develop techniques for revealing growth in certain other outcomes such as the elements of reflective thinking, attitudes, creativeness, personal interest and social sensitivity; and third, to provide methods of detecting strengths and weaknesses of pupils as they move toward the desired goals. Some evaluation devices are:

Those requiring the use of pencil and paper - verbal tests, either objective or essay. Samples of types of objective tests are as follows:

Completion Test - Complete the sentence

1. The part of the flower which produces pollen is called the ____________.

Matching Test:- In the parentheses at the right of column 2, place the number of the answer in column 1 which best agrees.

Column 1	Column 2
1. Small green plant	Trichina . . . . ( )
2. Produces eggs	
3. Roundworm in pork	Glucose . . . . ( )
4. Is a tree	
5. Protein material	Spirogyra . . . . ( )
6. A form of sugar	
7. Has a backbone	Vertebrate . . . . ( )
8. Produces pollen	
9. A tapeworm	Stamen . . . . ( )

Multiple Choice Test - in the parentheses at the right, place the number of the answer which best agrees.

1. A vertebrate is an animal that . . . . ( )
(1) can swim; (2) has three pairs of legs; (3) has a backbone; (4) has arms.

Diagrams, pictures, charts, rating scales, and check lists are additional evaluation devices.

Analysis of work products - apparatus, set-ups, notebooks, student collections, class questioning and discussion, observation of significant behavior, and conferences and interviews with individuals and small groups.

TEXT, REFERENCES AND AUDIO-VISUAL AIDS

I. Suggested Text - Your Biology, Smith and Lisonbee. Harcourt, Brace and Company, 1958.

II. Additional References

Biology, The Living World, Curtis and Urban. Ginn and Co., 1958.

Living Things, Fitzpatrick and Bain, Henry Holt and Co., 1958.

Biology and Human Progress, Eisman and Tanzer. Prentice-Hall, Inc., 1958

How to Know the Mammals, Booth. William C. Brown Co., 1949.

How to Know the Immature Insects, Chu. William C. Brown Co., 1949.

How to Know the Mosses and Liverworts, Conrad. William C. Brown Co. 1944

How to Know the Fall Flowers, Cuthbert. William C. Brown Co. 1948.

How to Know the Spring Flowers, Cuthbert. Wm. C. Brown Co. 1949.

How to Know the Protozoa, Jahn. Wm. C. Brown Co., 1949.

How to Know the Beetles, Jaques. Wm. C. Brown Co., 1951.

How to Know the Insects, Jaques. Wm. C. Brown Co., 1947.

How to Know the Land Birds, Jaques. Wm. C. Brown Co., 1947.

How to Know the Trees, Jaques. Wm. C. Brown Co., 1946.

How to Know Living Things, Jaques. Wm. C. Brown Co., 1946.

How to Know Plant Families, Jaques. Wm. C. Brown Co., 1948.

How to Know the Spiders, Kaston. Wm. C. Brown Co., 1952.

How to Know the Grasses, Pohl. William C. Brown Co., 1954.

III. Audio-visual aids

00-1	About Faces
00-2	Accent on Use
0-649	Adventuring Pups
00-224	Africa, South, Riches of the Veldt
0-6	Agricultural India
0-12	Alaska
0-13	Alimentary Tract
0-593	Animals in Winter
0-19	Animals of the Zoo
0-279	Animals Unlimited
0-486	Ants
0-21	Aphids
0-516	Arctic Border Lands in Winter
0-488	Australia
0-487	Attitudes and Health
0-825	Bacteria - Friend and Foe
0-34	Beach and Sea Animals
0-587	Beaver
00-16	Bear and Its Relatives
OX-75	Beaver Valley
0-35	Beetles
0-38	Birds of Prey
0-39	Birds of the Dooryard
0-49	Bread
0-524	Bushland Symphony
0-56	Camouflage in Nature
00-282	Cattle and the Corn Belt
00-24	Cicada
0-80	Common animals of the Woods
0-91	Dairy Industry
0-93	Deer and Relatives
0-533	Dental Health
0-349	Roadrunner Battles Rattlesnake
0-257	Mammals of the Western Plains
OX-32	Poultry, A Billion Dollar Industry
0-115	Earthworm
0-238	Eskimo Sea Hunters
0-838	Fish are Interesting
0-839	Fish Out of Water
0-597	Five Colorful Birds
0-150	Frog
00-45	Grasshopper
0-183	Ground Water
0-185	Growth of Flowers
0-195	Honeybee
0-200	Housefly
0-202	How Nature Protects Animals

0-784	Insects are Interesting
00-242	Introduction to Biology
0-217	Irrigation Farming
0-785	Kangaroos
0-227	Killers of the Insect World
0-666	Laplanders
0-277	Life Cycle of the Mosquito
0-241	Life of Plants
0-255	Mammals of the Countryside
0-850	Mammals are Interesting
0-272	Monarch Butterfly
0-276	Moths
0-291	Ocala
0-293	Orange Grower
0-295	Our Animal Neighbors
0-505	Our Soil Resources
0-302	Paper
0-551	Plant Growth
0-317	Plant Traps
0-326	Pond Insects
00-304	Rice, Story of
0-351	Robin
0-357	Science and Agriculture
0-613	See Better: Healthy Eyes
0-361	Seed Dispersal
0-369	Shell Fishing
0-377	Snakes are Interesting
00-306	Snakes, Friends or Foes
0-378	Snapping Turtle
0-392	Spiders
0X-35	Story of Canadian Pine
0-403	Swat That Fly
0-421	Tiny Water Animals
00-133	Vanishing Herds
0-443	Water Birds
0-511	Zoo, The

BIOLOGY: GENERAL

OVERVIEW

Courses in biology have always been of special interest to young people. Biology: General, an outline of ten units, has been designed to meet that interest and to make a definite contribution toward solving some of the problems peculiar to the high school age-group. Included is ample material so that the teacher can select principles and problems to fit a particular class whether made up of college-bound students or of students whose formal education will terminate with high school.

It is not expected that all divisions of each unit will be utilized in any one class. The interests and abilities of a given group will determine the extent of the course; however, an alert biology teacher will keep two goals in mind as a guide in the selection of material: 1) the development of understanding based on fundamental, functional principles of biology; and 2) the improvement of pupils' ability to express what they learn with scientific clarity.

GENERAL OBJECTIVES

To develop scientific attitudes, methods, and skills.

To develop an understanding of the fundamental principles of biology.

To develop a background for future scientific study.

To develop a command of scientific facts and information in preparation for a future life.

To develop an appreciation for the relationship between the fundamental principles of biology and human behavior.

To develop interest and skill in individual investigation.

To develop an interest in vocational and avocational biology.

To develop a cultural background based upon scientific facts and principles.

SPECIFIC OBJECTIVES

Students should be trained to understand the fundamental principles of biology which apply to both plants and animals, with emphasis on the fact that all living things are similar.

To acquire a knowledge of the groups of plants and their life processes.

To acquire a knowledge of the main groups of animals and of how they carry on their life activities.

To recognize some of the more common types of plants and animals on sight.

To understand the methods of reproduction of plants and animals and the possibilities for improving the various species through application of the laws of heredity.

To understand the interrelationships of living things.

To emphasize the care of the human body as a step in the improvement of health.

To see the relationship of plants and animals to the development of civilization.

To understand some of the problems which affect human existence: food, health, disease, improvement of the race.

To understand the value and the methods of conservation.

To appreciate the importance of the work of scientists of the past and present, and to gain insight into the opportunities of future scientists.

To master a biological vocabulary

To learn the parts and uses of the compound microscope.

To use scientific skills and methods.

To have a better appreciation of nature.

To see biology as a science with civic value.

To discount various superstitious beliefs.

To develop activities for gainful occupation of leisure time.

METHODS, PROCEDURES AND TECHNIQUES

This outline of units is prepared to facilitate teaching. Best results will be obtained if the teacher follows the sequence of the suggested units and unit divisions. The text and other teaching materials need to be fitted to the outline since it does not follow any one text specifically. The wide variety of materials suggested, though, offers a teacher the freedom necessary to achieve the objectives best suited to any given class.

The teacher needs to plan a definite approach to a unit or an assignment. It is essential that student interest be created or stimulated. This interest may be aroused in various ways: by the use of specimens, living if possible; and by thought-provoking introductions like this: "The frog breathes air by means of lungs, yet it hibernates all winter in the mud under water. How can it breathe?"

Students should be encouraged to develop individual and group interests. Collections by the pupil are more effective as teaching aids than collections mac by the teacher. Explanations or demonstrations of pupil projects can aid in keeping class members aware of how the fundamental principles of biology--and the facts learned--are applicable to everyday experiences. The teacher should keep in mind that these principles and facts are important only as they contrib ute to a better understanding by the pupil. For instance, the pupils should b made to realize the importance of building a biology vocabulary; yet rote dril on the vocabulary included in the following units would be largely useless. The vocabulary "translated" into a necessary part of a group discussion or report is a growth in understanding.

Along with encouragement in independent development of interests, there should also be training in following specific instructions:

> Daily assignments should be definite and the attention of the class focused on them. One good practice is to write the assignments on the board where they can be easily seen.
>
> Definite laboratory problems should be assigned with a systematic method perscribed for writing them up. Some type of laboratory notebook or diagram book should be required. Simplicity in the form for the write-up eliminates confusion. For example, three headings; PROBLEM, METHOD USED, and OBSERVATIONS serve better than a complex outline.

The teacher should be thoroughly prepared for any laboratory problems assigned. The laboratory days need not follow a definite weekly pattern although such a pattern may be necessary in some schools. After a laboratory exercise is completed, there should always be a general class discussion of the problem and observations. If a demonstration is part of the laboratory problem, it should be performed by one or more of the pupils; or, if that procedure is not possible then it should be performed by the teacher with certain of the pupils selected to help.

In conducting a class discussion, the teacher should frame questions so that they do not suggest the answers. Questions should be asked of all pupils, not just the volunteers. Time has to be allowed for the students to formulate answers, especially early in the course, since improvement of pupils' ability to express what he knows is a goal, not a pre-requisite, of the course. Exact wording; i.e., quoting from the text, is unnecessary in answers if the student shows understanding of the principle involved. And, along with teacher, questions, students should be encouraged to formulate their own questions, based both on textual material and on special interests or problems.

Variation in procedure, within the limits necessitated by the content of any day's assignment, will stimulate and maintain interest.

OUTLINE OF COURSE

Unit 1. Introduction to Biology

I. Biology - The science of life

- A. Meaning of biology
- B. Differences between living and non-living things
- C. Essential problems of living things
- D. Environmental conditions

II. Related biological sciences

- A. Pure sciences
- B. Vocational fields
- C. Avocational fields

III. Other sciences (optional)

- A. Chemistry and related sciences
- B. Physics and related sciences

C. Geology and related sciences
D. Biological phases of chemistry, physics, and geology

Vocabulary and Terms

anatomy
avocation
bacteriology
biochemistry
biology
biologist
botany
chemistry
cytology
dentistry
ecology
embryology
environment
eugenics
genetics
geology
hygiene
medicine
morphology
organism
ornithology
paleontology
pathology
pharmacy
physiology
pure science
sanitation
taxonomy
vocation
zoology

Unit 2. The Unity of Life

I. Plants and animals live together

A. Adaptations
    1. To the habitat
    2. For essential needs
    3. For special purposes
B. Symbiotic relationships
C. Life zones of the United States

II. Plants and animals have similar structures

A. Physical basis of life - cells
    1. Cell theory
    2. Protoplasm
        a. Cytoplasm and its parts
        b. Nucleus and its parts
        c. Fundamental properties
    3. Cell type-study
        a. Onion
        b. Squamous epithelial
B. Chemical basis of life
    1. Basic elements
        a. Sources of
        b. Preparation of
    2. Oxygen cycle
    3. Nitrogen cycle

III. Plants and animals have similar functional processes

A. Respiration
B. Digestion
C. Reproduction
D. Osmosis
(Optional)
E. Circulation
F. Transpiration
G. Excretion

Vocabulary and Terms

adaptation
Arctic-Alpine Zone
Austral Zone
Boreal Zone
carbon
cell
cell theory
centrosome
chromatin
commensalism
compound microscope
contractility
cytoplasm
diaphragm
digestion

Unit 2. The Unity of Life (Continued)

endoplasm
ectoplasm
fauna
flora
growth
habitat
hydrogen
irritability
life zone
metabolism
nitrogen
nitrogen cycle
nucleus
nucleoplasm
ocular
osmosis
ovary
oxygen
parasitism
plasmolysis
protoplasm
respiration
reproduction
symbiosis
vacuole
life functions
linin network
oxygen cycle
permeable membrane
squamous epithelium
Tropical Zone

Unit 3. The Plant Kingdom

I. Classification of living things (as a part of plant study)

  A. Value
  B. Method
    1. By natural basis
    2. By groups-Linne'
    3. By scientific names

II. Photosynthesis of green plants

  A. Purpose
  B. Essentials for
  C. Products of
  D. Interrelations of green plants and animals
    1. Food dependencies
    2. Balanced aquarium

III. Phyla of green plants

Note: A new classification of plants has been developed recently and is beginning to appear in the newer biological textbooks. Many authorities now give 10 or 11 phyla. About one-half of the phyla of the newer classification consists of phylum adaptations of the old families of algae. For example, the old family Cyanophyceae now becomes the new phylum Cyanophyta; the old family Chlorophyceae now is known as the phylum Chlorophyta, etc. Bryophyta are still Bryophyta but Pteridophyta and Spermatophyta are now grouped under the phylum Tracheophyta with Filicinae (ferns), Gymnospermae and Angiospermae as classes.

  A. Thallophyta
    1. Algae
      a. Groups and characteristics
      b. Type study
        (1) Spirogyra
        (2) Pleurococcus
    2. Fungi
      a. Bacteria
        (1) Kinds
        (2) Reproduction
        (3) Economic importance of
          (a) Harmful types
          (b) Beneficial types
      b. Yeasts
        (1) Fermentation

- (2) Reproduction
- c. Molds
  - (1) Beneficial
    - (a) Control of disease
    - (b) Preparation of certain foods
  - (2) Harmful
  - (3) Type study - common bread mold
- d. Taodstools and relatives
  - (1) Economic importance
  - (2) Type study - toadstool
- e. Lichens
  - (1) Composition
  - (2) Importance

- B. Bryophyta
  - 1. Liverworts - importance of
  - 2. Mosses
    - a. Importance of
    - b. Type study
      - (1) Polytrichum or
      - (2) Furnaria
- C. Pteridophyta
  - 1. Importance of
  - 2. Type study - fern
    - a. Sporophyte and parts
    - b. Gametophyte and parts
    - c. Alternation of generations
- D. Spermatophyta
  - 1. Gymnospermae
    - a. Cones
    - b. Leaves
      - (1) Advantages
      - (2)Structure
  - 2. Angiospermae
    - a. Monocotyledons
      - (1) Stem structure
      - (2) Leaf types
      - (3) Seeds and seedlings
    - b. Dicotyledons
      - (1) Parts of typical plant
        - (a) Leaf
          - 1. Types
          - 2. Structure
        - (b) Stem
          - 1. Types
            - a. Woody
            - b. Herbaceous
          - 2. Structure
            - a. In woody plants
            - b. In herbaceous plants
        - (c) Root
          - 1. Types
          - 2. Structure
      - (2) Function of typical plant
        - (a) Leaf
        - (b) Stem
        - (c) Root
    - c. Monocots and Dicots compared as to leaves, stems, and seeds.

Unit 3. The Plant Kingdom (Continued)

III. Value of plants

- A. On commercial products
- B. On development of civilization
- C. On national problems

Vocabulary and Terms

algae
Angiospermae
anther
bacillus
facteria
bast fiber
blade
Bryophyta
bud
cambium
chlorophyll
chloroplast
class
coccus
cortex
cotyledon
dicotyledon
family
fermentation
fibrous root
fission
filament
fungi
gametophyte
genus
fills
guard cells
Gymnospermae
herbaceous
hydra
hypocotyl
interrelation
kingdom
lichen
liverwort
miftin
monocotyledon
mycelium
order
ovary
ovule
paranchyma
petiole
phloem
alternation of generations
balanced aquarium
carbon dioxide
medullary ray
natural classification
netted venation
palisade tissue
palmately veined
parallel venation
photosynthesis

Unit 4. The Animal Kingdom

I. General information about the two sub-kingdoms

- A. Main structural differences
- B. Importance
  - 1. In food interrelationships
  - 2. In pollination
  - 3. In effect on the essential needs of man
  - 4. In the destruction of crops
  - 5. As parasites

II. Specific information about the two sub-kingdoms

- A. Invertebrata
  - 1. Protozoa
    - a. Types
    - b. Structure
      - (1) Ameba
      - (2) Paramecium
    - c. Reproduction
    - d. Connection with pathogenic problems
  - 2. Porifera
    - a. Simple sponge - food habits, structure
    - b. Interrelations with other animals
  - 3. Coelenterata
    - a. Hydra - food habits, structure, functions of ectoderm and endoderm
    - b. Alternation of generations
  - 4. Echinodermata
    - a. Starfish - characteristics (covering of body, symmetry)
    - b. Commercial importance
  - 5. Platyhelminthes
    - a. Parasitic kinds
      - (1) Tapeworms - parts of body, life cycle, control
      - (2) Flukes - types, control
    - b. Free-living kinds

Unit 4. The Animal Kingdom (Continued)

6. Nemathelminthes - parasitic types
    a. Hookworm - how contracted, life cycle, effects on man, how controlled
    b. Filaria Worm - how contracted, life cycle, effects on man, how controlled
7. Annelida
    a. Main groups
    b. Characteristics
    c. Economic importance
8. Mullusca
    a. Type study
        (1) Mussel
            (a) Shell
            (b) Body functions
        (2) Comparison of mussel and oyster
    b. Other groups
        (1) Gastropods
        (2) Cephalopods
    c. Characteristics
    d. Economic importance
9. Arthropoda
    a. Main classes, common insects - likenesses and differences
        (1) Grasshopper
            (a) External anatomy
            (b) Internal structure
            (c) Wing structure
            (d) Compound eye structure
            (e) Metamorphosis
        (2) Butterfly or moth
            (a) Scales
            (b) Antennae
            (c) Metamorphosis
        (3) Beetle
            (a) External anatomy
            (b) Metamorphosis
        (4) Honeybee
            (a) Stinging apparatus
            (b) Wing adaptation
            (c) Metamorphosis
            (d) Pollination

B. Vertebrata
1. Description of main classes
    a. Characteristics
    b. Examples
    c. Systems of organs - parts and functions
2. Divisions of main classes
    a. Pisces
        (1) Groups
        (2) Type study - perch
            (a) External anatomy
            (b) Internal anatomy
        (3) Adaptations to habitat
        (4) Importance - biological, recreational, and commercial
    b. Amphibia
        (1) Groups

Unit 4. The Animal Kingdom (Continued)

(2) Type study - frog
(a) External anatomy
(b) Internal structure
(c) Metamorphosis
(3) Commercial importance
c. Reptilia
(1) The form groups - examples and differences
(2) Poisonous types
(a) Pit vipers - examples, function of pits, type of fangs, snake bite remedies
(b) Coral snakes - relatives, type of fangs
(c) Gila monster - type of reptile, location of fangs
d. Aves
(1) Adaptations
(2) Identification
(a) Common water birds
(b) Common land birds
(3) Economic phases
(a) Destroyers of insects
(b) Weed seed eaters
(c) Birds of prey
(d) Game birds - land and water
(4) Methods of attracting
e. Mammalia
(1) Characteristics
(a) Similarities
(b) Differences - with emphasis on teeth
1. Rodentia
2. Even-toed Ungulata
3. Terrestrial Carnivora
4. Edentata
(2) Additional orders including primates
(3) Economic groups
(a) Predacious mammals
(b) Game mammals
(c) Domesticated mammals
1. Commercial and aesthetic importance
2. Ancestors

Vocabulary and Terms

aboral
ambulacrum
Amphibia
anaemia
Annelida
Arthropoda
Ascaris
Aves
barb
barbule
bivalve
branchia
Carnivora

Cephalopoda
Cestoda
Chiroptera
chitin
ciliata
cilium
clitellum
cloaca
Coelenterata
Coleoptera
columella
cross-pollination
Diptera

Echinodermata
ectoderm
Edentata
elephantiasis
endameba
endoderm
epiphragm
Filaria
filoplume
flagellum
Gastropoda
hooklet
hookworm

Hydra
Hymenoptera
hypnotoxin
Insecta
Insectivora
Invertebrate
katabloism
lateral line
Lepidoptera
macronucleus
Mammalia
Marsupilia
medusa

adductor muscle
alternation of generations
anthropoid apes
bilateral symmetry
caudal fin
collar cell
contour feather
contractile vacuole
dextral snail
domestic animal
down feather
erectile fangs

Unit 4. The Animal Kingdon (Continued)

gastral cavity
medusa bud
micronucleus
migrant
Mollusca
Myriapoda
nacre
Nemathelminthes
nematocyst
nephrodium
hepatic caccum
Malpighian tube
gastrovascular cavity

Unit 5. Human Biology

- I. Man's place in biology
  - A. Man as a vertebrate animal
    - 1. Major similarities to other vertebrates
    - 2. Major similarities to other mammals
    - 3. Scientific classification
  - B. Man's superiority over other animals

- II. Systems of Organs

  - A. Skeletal system
    - 1. Functions
    - 2. Major axial parts
    - 3. Major appendicular parts
    - 4. Joints
      - a. Immovable - sutures
      - b. Movable
        - (1) Types
        - (2) Examples
    - 5. Homologous and analogous parts
  - B. Muscular system
    - 1. Functions
    - 2. Types of muscles
      - a. Skeletal
      - b. Smooth
      - c. Cardiac
    - 3. Structure of a muscle
    - 4. Names of major muscles
      - a. Of skeleton
      - b. Of eyeball
    - 5. Relation to skeletal system
  - C. Circulatory system
    - 1. Functions
    - 2. Main parts
      - a. The heart
        - (1) Chambers
        - (2) Valves
        - (3) Cardiac cycle
      - b. The blood
        - (1) Characteristics
        - (2) Components
          - (a) Amount
          - (b) Types of cells - functions and formations
          - (c) Liquid
          - (d) Antigens
          - (e) Fibrins and platelets (coagulation)
      - c. The systems
        - (1) Venous
        - (2) Arterial
        - (3) Pulmonary
        - (4) Lymphatic

Unit 5. Human Biology (Continued)

- 3. Diseases
- D. Digestive system
  - 1. Functions
  - 2. Main parts
    - a. Alimentary canal
    - b. Glands
      - (1) Production of enzymes
      - (2) Action on types of food
    - c. Special features
      - (1) Peristalsis
      - (2) Absorption
- E. Respiratory system
  - 1. Functions
  - 2. Structural divisions
  - 3. Mechanics of breathing
  - 4. Relation to the blood system - including respiration in a cell
  - 5. Problems
    - a. Ventilation
    - b. Diseases
    - c. High Altitudes
    - d. Emergency treatment (artificial respiration)
- F. Excretory system
  - 1. Functions
  - 2. Products (cell metabolism)
  - 3. Main organ - kidney
    - a. Structure
    - b. Relation to other parts of the urinary system
    - c. Functions
  - 4. Other ofgans - functions
- G. Integumentary system
  - 1. Main parts
    - a. Skin
      - (1) Structure
      - (2) Functions
    - b. Appendages
  - 2. Functions
  - 3. Diseases
  - 4. Necessary care
- H. Endocrine system
  - 1. Hormones - general function
  - 2. Glands
    - a. Thyroid
      - (1) Location
      - (2) Specific function
      - (3) Problems
        - (a) Deficiency diseases
        - (b) Hyperthyroidism
    - b. Pituitary
      - (1) Location
      - (2) Specific function
        - (a) Anterior lobe-effects
        - (b) Posterior lobe-effects
    - c. Isles of Langerhans
      - (1) Location
      - (2) Specific function
      - (3) Problem - diabetes (insulin)

Unit 5. Human Biology (Continued)

- d. Adrenal
  - (1) Location
  - (2) Specific function
    - (a) Cortex - effects
    - (b) Medulla - effects
- e. Other glands

I. Nervous system
- 1. Functions
- 2. Main parts
  - a. Central nervous system
    - (1) Brain
      - (a) Cerebrum, description and functions
      - (b) Midbrain, parts and functions
      - (c) Cerebellum, location and functions
      - (d) Pons, function
      - (e) Medulla Oblongata, location and functions
    - (2) Spinal cord
      - (a) Structure
      - (b) Function
  - b. Peripheral nervous system
    - (1) Cranial nerves
      - (a) Numbers and names
      - (b) Functions
    - (2) Spinal nerves
  - c. Autonomic nervous system
    - (1) Parasympathetic - functions
    - (2) Sympathetic - functions
- 3. Nerve cells
  - a. Cell body
  - b. Cell processes
    - (1) Dendrites
    - (2) Axons
    - (3) Fibers
      - (a) Afferent
      - (b) Efferent

Vocabulary and Terms

adrenalin
afferent
analogous
antigens
aorta
aortic arch
appendix
assimilation
atlas
axon
bile
capillary
carpals
cerebellum
cerebrum
clavicle
coccyx
colon
cranium
cretinism
dentine
dendrite
dermis
diastole
digestion
duodenum
edems
efferent
endoskeleton
enzymes
epidermis
erythrocytes
fibrinogen
follicle
goiter
hemoglobin
Hominidae
homologous
hormones
humerus
ileum
insulin
integument
lymph
lymphatics
mandible
maxilla
medulla
oblongata
nerve fiber
pelvis
pericardium
peritoneum
pituitrin
plasma
platelets
Primates
pylorus
radius
renal
sacrum
scapula
sinus
spleen
sternum
suture
systole
tarsals
thyroxin
tibia
tissue
ulna
ventricles
villi
alimentary canal
alveoti (of teeth)
appendicular skeleton
autonomic nervous system
axial skeleton
ball and socket jount
bicuspid valve
blood pressure
carptod arteru
central nervous syste
cervical vertebrae
coronary circulation
cranial nerves
deciduous teeth
femoral artery
gall bladder

Unit 5. Human Biology (Continued)

gliding joint
hinge joint
inferior venacava
superior venacava
semilunar valves
Islets of Langerhans
jugular veins
thoracic vertebra
lumbar vertebrae
peripheral nervous system
sympathetic nervous system
portal system
pulmonary circulation
red marrow
sciatic nerve
sebaceous glands

Semester 2

Unit 6. Nutrition and Health

I. Foods

- A. Purpose
  - 1. Production and release of energy
  - 2. Growth and maintenance of life
- B. Types
  - 1. Energy foods
    - a. Carbohydrates - types, sources, body uses, chemical elements, chemical tests for
    - b. Proteins - the amino acids, sources, body uses, chemical elements, chemical tests for
    - c. Fats - sources, purpose, tests for
  - 2. Non-energy foods
    - a. Necessary
      - (1) Water - requirements, source, uses by the body, problems of evaporation and dehydration
      - (2) Vitamins - purpose, sources, main types, effects
      - (3) Minerals - essential kinds, sources
    - b. Accessory
      - (1) Stimulants - beneficial and harmful effects
      - (2) Condiments - types and uses
      - (3) Food flavors
  - 3. Special problems on foods
    - a. Components of a balanced diet
      - (1) Calories needed by
        - (a) A high school boy or girl
        - (b) An adult man or woman
      - (2) Vitamins and minerals - sources and the results of deficiences
    - b. Daily diet
      - (1) Importance
      - (2) Suggested study
        - (a) Check a daily diet for balance
        - (b) Plan a balanced diet for one or two school days
        - (c) Compare (a) and (b)

II. Body requirements besides food

- A. Fresh air and exercise
- B. Adequate sleep and rest
- C. Plenty of water
- D. Personal hygiene
- E. Proper first-aid measures

Unit 6. Nutrition and Health (Continued)

III. Health Hazards

- A. Narcotic drugs
    - 1. Medicinal value
    - 2. Harmful effects: Problem of forming a habit (examples)
- B. Tobacco
    - 1. Harmful effects in general on blood pressure, pulse rate, eyes
    - 2. Harmful effects on young people
        - a. Their need for oxygen efficiency
        - b. The effect of tobacco on the oxygen efficiency
        - c. The relation of decreased oxygen efficiency to athletics
- C. Alcohol
    - 1. Physical effects including "reaction time"
    - 2. Emotional effects
    - 3. Economic effects
- D. Bacterial and virus diseases
    - 1. Examples of more common types
    - 2. Effects
    - 3. Immunity - natural and acquired
    - 4. Preventive measures
- E. Protozoal and worm diseases
    - 1. Malaria
        - a. Description of main types
        - b. Recognition of carrier
        - c. Control
    - 2. Hookworm - effects and control
    - 3. Trichinosis - effects and prevention
    - 4. Elephantiasis - effects and control
- F. Organic Diseases
    - 1. Heart
        - a. In young people - rheumatic fever - effects on normal living
            - (1) Scar tissue
            - (2) Valvular damage
        - b. In middle age
            - (1) Hypertension - effects
            - (2) Embolism - origin
            - (3) Thrombosis - origin
            - (4) Occlusion - location, causes, later limitations (sudden exertion)
    - 2. Cancer
        - a. Description
        - b. Causes
        - c. Most frequent locations
        - d. Ages of people involved
        - e. Symptoms
        - f. Detection - early detection from general and x-ray examination
        - g. Treatment - surgery, x-ray, radium and radioactive isotopes
    - 3. Mental diseases
        - a. Causes - inherited, organic, and functional disturbances
        - b. Treatment - preventative and medical

IV. Aids for Emergencies

- A. What to keep in a first-aid kit
- B. What to do in case of
    - 1. Accidental injury

Unit 6. Nutrition and Health (Continued)

    - 2. Slight and severe wounds
    - 3. Broken bones
    - 4. Asphyxiation
    - 5. Fainting
    - 6. Snake bite
  - C. What to do in case of National Emergency

Vocabulary and Terms

accessory foods
amino acids
asphyxiation
balanced diet
calorie
carbohydrates
carrier
condiment
oxygen efficiency
dehydration
diet
elephantiasis
embolism
energy foods
first aid
habit
hygiene
hypertension
narcotic
necessary foods
nutrition
occlusion
organic disease
protein
rheumatic fever
protozoal disease
stimulant
thrombosis
trichinosis
valvular damage
virus
vitamin
worm disease
coronary disease
acquired immunity
bacterial disease
deficiency disease
natural immunity

Unit 7. Behavior Patterns

- I. Unlearned behavior
  - A. Origin
  - B. Types
    - 1. Tropisms and taxis
      - a. Plant responses
      - b. Animal behaviors
    - 2. Simple reflex
      - a. Reflex arc and its parts
      - b. Examples
    - 3. Instincts
      - a. A chain of reflexes
      - b. Examples
  - C. Maturation
  - D. Advantages
- II. Learned behavior
  - A. Conditioned reflex - examples
  - B. Habits
    - 1. Development
    - 2. Comparison with instincts
    - 3. Control
      - a. Keeping good ones
      - b. Breaking bad ones
  - C. Memory
    - 1. Comparison with habit
    - 2. Kinds
      - a. Immediate
      - b. Deferred
  - D. Emotion
    - 1. Types
    - 2. Control
      - a. Brain center
      - b. Training

Unit 7. Behavior Patterns (Continued)

- E. Reasoning
  - 1. Related to memory
  - 2. Process

III. Senses of Man

- A. Correlating mechanism
  - 1. Receptors
  - 2. Adjustors
  - 3. Effectors
- B. Sense of sight
  - 1. Parts of the eye
    - a. Names and descriptions
    - b. Functions
  - 2. Blind spot
  - 3. Defects
    - a. Farsightedness
    - b. Nearsightedness
    - c. Astigmatism
    - d. Cataract
  - 4. Care of eyes
- C. Sense of hearing
  - 1. Sound
  - 2. Parts of ear
    - a. Divisions and names
    - b. Functions
    - c. Care
  - 3. Adjuncts to ear
    - a. Semicircular canals
      - (1) Location
      - (2) Function
    - b. Eustachian tube
      - (1) Location
      - (2) Function
- D. Sense of Smell
  - 1. Location of receptors - including various functions of the nose
  - 2. Effects resulting from continuous stimulation
- E. Sense of taste
  - 1. Taste buds
  - 2. Condition of food
  - 3. The four tastes
  - 4. Relation to sense of smell
- F. Sense of touch
  - 1. Types - like pain, heat, cold
  - 2. Locations
- G. Others

IV. Conscious behavior

- A. Muscular coordination
- B. Effects of endocrine glands
- C. Cultural individual behavior
  - 1. Speech
  - 2. Physical attitudes
  - 3. Cultural manners
- D. Behaviors in relation to society

Unit 7. Behavior Patterns (Continued)

1. Courtesy to others
2. Respect for opinions of others
3. Respect for individual rights of others
4. Respect for property rights of others

Vocabulary and Terms

anvil
blind spot
cataract
cochlea
cornea
effector
emotion
hammer
hydrotropism
instinct
iris
maturation
memory
optic nerve
pain spots
phototropism
pinna
pupil
reaction time
reasoning
receptor
reflex
reflex arc
retina
stirrup
taste buds
tropism
typanum
vitreous body
semicircular canals
aqueous humor
auditory canal
conditioned reflex
eutachian tube
positive taxis
negative taxis

Unit 8. Reproduction

I. Types

- A. Asexual
  - 1. Fission
    - a. Plants
    - b. Animals
  - 2. Sporulation - spores
    - a. In plants
    - b. In animals
  - 3. Vegetative processes
    - a. Plant illustrations
    - b. Animal illustrations
- B. Sexual
  - 1. Parthenogenesis
    - a. Animal examples
    - b. Plant examples
  - 2. Isogamy - isogametes
    - a. Interchange of micro-nuclear material
    - b. Conjugation - zygote
    - c. Animal and plant examples
  - 3. Heterogamy
    - a. Plants
      - (1) Sperm organs
      - (2) Egg organs
      - (3) Pollination
      - (4) Fertilization - zygote
      - (5) Embryo
    - b. Animals
      - (1) Sperm organs
      - (2) Egg organs
      - (3) Fertilization - zygote
      - (4) Embryo
    - c. Man
      - (1) Sperm and egg organs
      - (2) Functions of reproductive system - to produce, furnish food, and protect the embryo

Unit 8. Reproduction (Continued)

- II. Animal embryology
  - A. Total cleavage
    - 1. Equal
      - a. Examples
      - b. Characteristics
        - (1) Sizes of daughter cells
        - (2) Formation of blastula
          - (a) Blastoderm
          - (b) Blastocoel
        - (3) Formation of gastrula
          - (a) The three germ layers
          - (b) Beginning coelom
          - (c) Beginning enteron
    - 2. Unequal
      - a. Examples
      - b. Characteristics
        - (1) Sizes of duaghter cells
        - (2) Animal and vegetal poles
        - (3) Germ layers
        - (4) Beginning nervous system
          - (a) Neural groove
          - (b) Neurocoele
          - (c) Primitive brains
            - 1. Origin of parts of brain
            - 2. Cranial nerves - frog and chick
  - B. Discoidal partial cleavage
    - 1. Examples
    - 2. Relation to total cleavage
    - 3. Specific study - parts of fertile egg of chick
      - a. Germ layers
      - b. Heart and other organs
  - C. Man's evolvement
    - 1. Early cleavage stages
    - 2. Comparison with lower animals
      - a. Primitive brains
      - b. Cranial nerves
      - c. Formation of heart
        - (1) Successive chambered condition
        - (2) Perforated condition of the septum of auricles
          - (a) Reason for
          - (b) Effects of improper closing
    - 3. Functions of germ layers
      - a. Reason for name
      - b. Systems of organs and parts produced

Vocabulary and Terms

animal pole
asexual
blastocoel
blastoderm
blastomere
blastula
cleavage

embryo endoderm
enteron
fertilization
fission
gamete
gastrula
germ layers

mesoderm
micromere
neural groove
neurocoele
ovary
ovum
parthenogenesis

spore
sporulation
testis
total cleavage
auditory nerve origin
cross-pollination

equal total cleavage
olfactory nerve origin
optic nerve origin

Unit 8. Reproduction (Continued)

coelom
conjugation
daughter cell
ectoderm
heterogamy
isogametes
isogamy
macromere
pollination
primitive brains
sexual
spermatozoa
discoidal cleavage
partial cleavage
vegetative reproduction

Unit 9. Genetics

I. Variation

- A. Plant - leaves of elm tree
- B. Animal - human pulse rate

II. Mutations

- A. Theory
- B. Illustrations

III. Factors in heredity

- A. Mendel's Laws
  - 1. Dominance
  - 2. Purity of the gametes
  - 3. Unit characters
- B. Genes - relation to chromosomes
- C. Illustrations
  - 1. Monohybrids
    - a. Dominance
      - (1) Complete - ratio 3:1
      - (2) Incomplete - ratio 1:2:1
    - b. Back crosses
      - (1) Without dominance - ratio 1:1
      - (2) With dominance - ratio - 1:0
  - 3. Dihybrids - ratio 9:3:3:1
  - 4. Trihybrids - ratio 27:9:9:9:3:3:3:1

IV. Mechanism of heredity

- A. Mitosis
  - 1. Homotype - or equational division
    - a. Phases and their essentials
    - b. Differentiating characters
  - 2. Heterotype - meiosis or reduction division
    - a. Chromosomes do not divide
    - b. Number of chromosomes is reduced
- B. Spermatogenesis
  - 1. Primordial germ cells
  - 2. Formation of
    - a. Primary spermatocyte
    - b. Secondary spermatocyte
    - c. Spermatid
    - d. Sperm cell - parts
  - 3. Homotype and heterotype mitosis
  - 4. Purifying hybrid gametes
- C. Oogenesis
  - 1. Primordial egg cells

Unit 9. Genetics (Continued)

2. Formation of
    a. Primary oocyte
    b. Secondary oocyte and polar body
    c. Ootid and polar bodies
    d. Ovum
3. Homotype and heterotype mitosis
4. Purifying hybrid gametes

IV. Human heredity

A. Examples of laws of heredity
    1. Kinds of crosses
        a. Monohybrid
            (1) Straight
            (2) Back
        b. Dihybrids
        c. Trihybrids
    2. Homozygons and heterozygons - conditions
    3. Linkage
    4. Lethal genes
    5. Rh factor
B. Sex determination
    1. The sex chromosomes
        a. Male
        b. Female
    2. Sex-linked characters
        a. Dominant in the male
        b. Recessive in the female

V. Changes in development

A. Primitive man - progressive types
B. Races of modern man - major differences
C. Evidences of change

Vocabualry and Terms

anaphase
back cross
centrosome
chromatin
chromosome
dihybrid
dominant
fibril
fossil
F_1 generation
F_2 generation
gene
heterozygous

homozygous
hybrid
lethal genes
linkage
meiosis
metaphase
mitosis
monohybrid
mutation
oogenesis
ootid
polar body
primary oocyte

prophase
pure type
recessive
Rh factor
sex chromosome
spermatogenesis
spermatid
spindle
telophase
trihybrid
X chromosome
Y chromosome
variation

vestigial
contrasting genes
equational division
equatorial plate
flagellum of sperm
geographical distribution
heterotype mitosis
homotype mitosis
hybrid gametes

law of dominance
mechanism of heredity
primary spermatocyte
primordial germ cell
reduction division
secondary spermatocyte
sex determination
sex-linked characters

Unit 10. Conservation

I. Problems of conservation

Unit 10. Conservation (Continued)

- A. Wildlife
    - 1. Fish
        - a. Recreational value
        - b. Types - food and game
            - (1) Connection with productive lakes and streams
            - (2) Connection with water pollution
        - c. Protection
            - (1) Laws
            - (2) Hatcheries
    - 2. Birds
        - a. Recreational value
        - b. Types - song and game
            - (1) Food habits
            - (2) Responses to attraction
        - c. Protection
            - (1) Hunting laws for game and non-game birds
            - (2) Methods used in protecting nesting places of game birds
            - (3) National study organizations
    - 3. Mammals
        - a. Recreational value
        - b. Commercial aspects
        - c. Types
            - (1) Game
                - (a) Methods of protecting
                - (b) Hunting and trapping laws
            - (2) Predators - value
    - 4. Forests
        - a. Value
            - (1) Recreational
            - (2) Commercial products - lumber, paper, fire wood, poles and posts, rubber, synthetic fibers, etc.
            - (3) Aid to conservation
                - (a) Prevents soil erosion
                - (b) Conserves water
                - (c) Protects wildlife
        - b. Destructive lumbering practices of the past
        - c. Reforestration
        - d. Enemies
            - (1) Fire - man-caused and lightning
            - (2) Insects
            - (3) Diseases
        - e. National parks - location, recreational and aesthetic value
- B. Soil and water
    - 1. Soil
        - a. Origin
        - b. Kinds
        - c. Erosion
            - (1) Cause
                - (a) Wind
                - (b) Water
            - (2) Prevention
                - (a) Grass lands
                - (b) Good farming practices
                    - 1. Crop rotation
                    - 2. Terracing
                    - 3. Strip cropping

Unit 10. Conservation (Continued)

            4. Legumes
            5. Commercial fertilizers
        2. Water
            a. Sources of drinking water
            b. Floods
                (1) Effects on drinking water
                (2) Reasons for floods
                (3) Control of floods
                    (a) Local
                    (b) National
            c. Lakes and ponds
                (1) Water storage
                (2) Homes for wildlife
                (3) Recreational values
            d. Water pollution
                (1) Sewage disposal
                (2) Factory wastes
                (3) Oil seepage

II. Answers to the problems of conservation

    A. History of conservation of national forests
    B. Commissions
        1. International-migratory animals
        2. National
            a. National Conservation Commission - purpose
            b. National Wildlife Federation - federal aid in wildlife management
            c. Bureau of Reclamation - functions
            d. Others - functions
        3. State Missouri Conservation Commission
            a. Divisions
            b. Purposes

Vocabulary and Terms

animal refuge
closed season
conservation
contour plowing
cover crop
crop rotation
ecology
extinct animals
fire line
game birds
game mammals
green-manure crop
ground water
hatchery
humus
legume
migratory
natural resources
non-game birds
open season
predator
reclamation
reforestration
runoff water
soil erosion
subsiol
soil binding plants
strip cropping
terracing
top soil
water pollution
water table

TESTING AND EVALUATION

Oral quizzes and short spot quizzes may be given as the teacher desires. Written tests on separate sections of a unit may be given where the unit is long in content. Such an examination may be either objective in character, or it may consist of essay type questions. In evaluating the achievement of pupils for grades, it is advisable for the individual teacher to group all similar classes together to get a wide performance index.

A few sample objective questions are included below:

Matching Test - in the parenthesis at the right of Column 2, place the number of the answer in Column 1 which is best associated with the accompanying item.

Column 1

1. Filaria
2. Platyhelminthes
3. Ameba
4. Found in coal pits
5. Porifera
6. Leech
7. Coperhead
8. Annelida
9. Tapeworm
10. Coelenterata

Column 2

Fission . . . . ( )

Phylum of hydra . . . . ( )

Elephantiasis . . . . ( )

Pit viper . . . . ( )

Earthworm . . . . ( )

Multiple Choice Test - in the parenthesis at the right place the number of the answer which best finishes the statement.

1. The main method of reproduction of the ameba is . . . . ( )
(1) sporulation; (2) fission; (3) vegetative; (4) conjugation.

Completion Test - complete the statements.

1. The name of the phylum which includes the hydra is ____________________.

TEXT, REFERENCES AND AUDIO-VISUAL AIDS

I. Text - Everyday Biology, Curtis, Caldwell, Sherman. Ginn and Co.

Unit 1. Introduction to Biology, pp. 3-10, 14, 26, 42-43, 630-650

Unit 2. The Unity of Life, pp. 14-45, 58-61, 339-340, 381-382, 390, 549

Unit 3. The Plant Kingdom, pp. 61-65, 70-146, 557

Unit 4. The Animal Kingdom, pp. 149-237

Unit 5. Human Biology, pp. 343-352, 365-371, 389-409, 426-427

Unit 6. Nutrition and Health, pp. 164-170, 302-352, 470-538, 526-538

Unit 7. Behavior Patterns, pp. 414-445, 451-461

Unit 8. Reproduction, pp. 542-588

Unit 9. Genetics, pp. 591-623

Unit 10. Conservation, pp. 246-297

II. Additional Text References

Modern Biology, Moon, Mann, Otto. Henry Holt and Co.

Elements of Biology, Ruth Dodge. Allyn and Bacon, Inc.

Exploring Biology, Ella T. Smith. Harcourt, Brace and Co.

III. Audio-Visual Aids

The following is a list of audio-visual aids selected from the materials in the Audio-Visual Education Department of the Kansas City schools. It is suggested that the teachers for this course confine their film selections to this list in order to avoid duplications.

0-1	A.B.C. of Forestry
0-2	Acres of Rice
OX-5	Alaska's Silver-Millions
00-151	Alcohol and the Human Body
0-18	Animals in Modern Life
0-279	Animals Unlimited
0-704	Back-Pressure Arm-Lift Artificial Respiration
00-14	Back to Missouri
OX-9	Before the Doctor Comes
0-42	Body Defenses Against Disease
00-148	Body Fights Bacteria
0-59	Care of the Feet
0-779	Cecropia Moth
0-527	Cell Division
0-583	Cheese and Cheese Making
0-82	Conservation of Natural Resources
0-83	Consumption of Foods
0-99	Digestion of Foods
00-153	Drunk Driving
0-494	Ears and Hearing
OX-60	Earth Shall Give Back Life
0-123	Endocrine Glands
0-130	Eyes and Their Care
0-726	First Aid Fundamentals
0-137	First Aid on the Spot
0-781	Flight of the Sea Birds
0-141	Flowers at Work
0-143	Foods and Nutrition
0-145	Forestry and Forest Industries
0-163	Fungus Plants
0-193	Heredity
00-49	High Over the Border
0-208	Immunization
0-783	Insects
OX-43	Kopa's
0-235	Leaves
0-238	Life in a Drop of Water
0-743	Mental Health
0-275	Mosquito - Public Enemy
0-478	Nose, Throat and Ears
0-284	Nervous System
00-300	Obesity
00-166	Pharmaceutical Products
00-461	Rabies
0-343	Rain on the Plains
0-344	Reaction in Plants and Animals
0-353	Roots of Plants
0-717	Skeleton (The)
0-556	Snakes
0-639	Sound
00-135	Vitamins; A,B,C,D

PROFESSIONAL AIDS

Natural History Magazine by The American Museum of Natural History, Central Park West at 79 Street, New York 24, New York.

Missouri Conservation Magazine, Missouri Conservation Commission, Jefferson City, Missouri.

Science Service Material from Science Service, 1719 North Street, N. W., Washington 6, D. C.

Ken-A-Vision (projector for microscopic slides), made in Lee Summitt, Mo.

BIOLOGY: ADVANCED PLACEMENT

College Level

OVERVIEW

Biology:-Advanced Placement is an intensive college-level course for able and ambitious high school seniors. It enables these students to pursue more advanced courses during the freshman year in a university or college. It offers challenging educational experiences and stimulates interest in biological sciences.

The course emphasizes functional morphology, evolution, interdependence of organisms and environment, and animal adaptations and behavior. It is designed to develop an understanding of underlying principles of biology.

SELECTION OF STUDENTS AND CLASS SIZE

Since a thorough presentation of biological concepts involves chemistry, students taking the course should have completed a course in chemistry. Because the course is intensive, each pupil should have completed Biology: General with a mark above average. He should have an active interest in biology and in the search for truth. Each should be selected with the consent of the parent who realizes the course is of college caliber and that it will require more time and effort than a general high school course.

GENERAL OBJECTIVES

To lay a solid background for more advanced work in college or university.

To challenge the more able students.

To nurture a spark of interest kindled in earlier general biology.

To discover and stimulate scientific ability and interest.

To develop desirable and necessary attitudes and skills for more successful living.

To impart to the student an understanding of the progressive nature af science.

To tie science teaching to reality.

SPECIFIC OBJECTIVES

To show the relationship of biology to other fields of human endeavor.

To develop general techniques for learning the names of organisms through the use of keys.

To build a working vocabulary in general biology.

To make students aware of the variety and value of life.

To develop skills in the use of the compound microscope and other laboratory tools.

To develop a better understanding of the physical and chemical processes occuring in protoplasm, cells, tissues, organs, systems, and organisms.

To acquaint students with the structures, functions, and classification of some of the multicellular animals, with special emphasis given to vertebrates through the use of dissection.

To build understanding of animal coordination and behavior.

To show the organization and some of the functions of the acellular organisms.

To build functional knowledge concerning the structures, functions, and classification of some of the multicellular thallophytes, bryophytes, and tracheophytes.

To provide a comparative comprehension of the life histories of various plant groups.

To establish a better understanding of cell division and embryonic diversification.

To study some of the causes of heredity.

To develop awareness of the existance and importance of an interdependence among all living things and their reaction to and upon the environment.

To stimulate comprehension of the abundance and problems of life itself.

To examine the theory of organic evolution.

To show the method of establishing truth through practice in problem solving.

To stimulate an appreciation of the beauty of life and the world of nature.

To stimulate curiosity concerning a knowledge of some of the biological problems of the future.

To develop an awareness of some specialized biological fields which are suitable for advanced study and reasearch.

METHODS, PROCEDURES AND TECHNIQUES

Biology: Advanced Placement should have three fifty-minute class meetings and two fifty-minute laboratory periods each week for 38 weeks. There should be opportunity for students to use the laboratory during other hours of the day.

It is desirable to vary methods and procedure during the year to stiumlate interest. Standard methods of teaching may be employed, such as: question-answer discussion, demonstration discussion, project discussion, and both individual and small group laboratory work.

The laboratory method is essential in order that the student may develop manipulative techniques, such as using the compound microscope and dissecting and making slides. The laboratory method gives each pupil practice in proposing and testing hypotheses and in using the scientific method. Laboratory work emphasizes the power of observation and gives to each participant first hand information which will help him understand biological concepts and principles. Laboratory procedure develops skill in recording and interpreting observations and findings. Diagrammatic representations should be encouraged rather than actual drawings in the laboratory work.

To develop scientific attitudes and to understand and apply biological concepts a basic and technical vocabulary is essential; therefore, vocabulary must be stressed throughout the course.

To help achieve desired results in Biology: Advanced Placement the following equipment is needed: living and preserved materials, a good textbook, reference books, periodicals, charts, still and motion pictures, blackboard, microscopes, dissecting instruments, and other usual laboratory instruments. Whenever possible, living organisms should be studied in order that the student may relate structure to function.

OUTLINE OF COURSE

Semester 1

Unit 1. Orientation

I. Definition of word "biology"

II. Relationship of biology to human endeavor

III. Methods in biology

- A. Scientific method
- B. Language
- C. Comprehension

Vocabulary and Terms

biology
botany
zoology
naturalist
fauna
flora
organism
vitalism

Physiologist
orientation
data
hypothesis
theory
teleological
ventral
dorsal

anterior
posterior
appendage
prosimal
distal
medial
mechanist

natural history
scientific method
scientific principle
radial symmetry
sagittal section
cross section

bilateral symmetry
universal symmetry
longitudinal section
coronal section
Ornithologist
Morphologist
lateral

Unit 2. Variety and Value of Living Things

I. Variety of organisms

- A. Identification
- B. Higher categories
- C. Phyla of life
- D. Man

II. Value of organisms

- A. Green plants
  - 1. Energy-yielding foods
  - 2. Non-energy-yielding foods

Unit 2. Variety and Value of Living Things (Continued)

    3. Use in building materials
    4. Use in fuels, light and power
    5. Stabilization
    6. Technological uses
    7. Detrimental aspects
    8. Aesthetic use
- B. Non-green plants
    - 1. Role in the matter cycle
    - 2. Soil fertility
    - 3. Sewage treatment
    - 4. Economic uses
    - 5. Medical uses
    - 6. Foods
    - 7. Pathology
- C. Animals
    - 1. Pathology
    - 2. Detrimental aspects
        - a. Carriers
        - b. Venoms and poisons
    - 3. Beneficial aspects
        - a. Competative activities
        - b. Use in building materials
        - c. Use in fuels, light and power
        - d. Use in technology
        - e. Food
        - f. Enjoyment
- D. Plants and animals as avocation
    - 1. Values to laymen
    - 2. Photography
    - 3. Hunting and fishing
    - 4. Observation
- E. Plants and animals as vocation - governmental, industrial, business, professional

Vocabulary and Terms

bryophyte
embryo
life cycle
classification
embryophyte
liverwort
tracheophyte
subphylum
terrestrial
psilopsids
horsetail
sphenopsid
fern
gymniosperm
monocot
dicot
herbaceous
protozoan
Parameci
acellular
vertebrate
sponge
invertebrate
coelenterate
flatworm
parasite
platyhelminth
nematode
mollusk
squid
clam
siphon
annelid
marine
leech
nervous
system
arthropod
specialization
crustacean
barnacle
shrimp
scorpion
spider
tick
arachnid
centipede
millipede
insect
echinoderm
segmentation
limy
scavenger
ooze
hydraulic
locomotion
chordate
notochord
respiratory
inanimate
herbivores
carbohydrate
protein
petiole
nodule
vitamin
malaria
BTU
stabilization
stagnation
technology
aesthetic
bacteriology
mycology
pathologist
fermentation
putrefaction
spongin
antibiotic
biosynthesis
vector
host
virulence
proliferation
ergotamine
disseminate
alkaloid
hermorrhage
toxic
rattlers
venom
copperhead
saliva
predator
entomology
shipworm
botfly
coquina
cephalopod
gastropod
malodorous
elasmobranchs
avocation
ecology
girdled tree

Unit 2. Variety and Value of Living Things (Continued)

tube feet
netted veins
free-living
sea urchin
sea lily
sense organ
pill bug
final host
brittle star
sea cucumber
fresh-water
coral snake
Gila monster
beaded lizard
alternate host
Elephantiasis
vascular plant
accessory part
parallel veins
segmented worm
horseshoe crab
economic biology
soil fertility
nitrogen fixation
cottonmouth moccasin

Unit 3. Physical and Chemical Nature of Protoplasm, Cells and Organisms

I. Protoplasm and cells

A. Abiogenesis
B. Discovery of the cell
C. The cell theory
D. History
E. Biogenesis
F. Life

II. Characteristics of protoplasm

A. Chemical composition
  1. Elements
  2. Compounds - organic and inorganic
B. Water
  1. Imbibition
  2. Solution
  3. Diffusion
  4. Dissociation
  5. Permeability
  6. Ionization
    a. Exchange
    b. Valence
    c. pH
  7. Osmosis
  8. Colloids - Sol-gel reversibility

III. Energy in connection with organisms

A. Measurement
B. Source
  1. Carbohydrates - simple and complex
  2. Fats, fatty acids, and glycerol
  3. Proteins and amino acids
  4. Nucleic acids
  5. Water
  6. Inorganic salts
  7. Vitamins
C. Storage
  1. Chlorophyll - light reactions and dark
  2. Enzymes - structure, origin, types, action
D. Digestion
E. Importance of nutrition and metabolism
F. Release of energy - aerobic and anaerobic
G. Degradation in energy

Unit 3. Physical and Chemical Nature of Protoplasm, Cells and Organisms (Continued)

Vocabulary and Terms

nucleus
cytoplasm
protoplasm
organic
microsome
nucleous
vacuole
anthocyanin
plastid
chlorophyll
cellulose
abiogenesis
bigenesis
compound
element
imbibition
solution
diffusion
ionization
osmosis
colloid
sol-gel
valence
pH
glycerol
aerobic
anaerobic
metabolism
absorption
fat
DNA
RNA
hemocyanin
omnivorous
cation
lipoid
anion
turgor
exosmosis
plasmolysis
endosmosis
isotonic
hypertonic
emulsion
calorie
avitaminosis
beri-beri
polyneuritis
pellagra
scurvy
richets
thiamin
riboflavin
niacin
folic acid
biotin
pyridoxine
calciferol
photosynthesis
enzyme
substrate
digestion
hydrolysis
autotrophic
saprophyte
carnivor
scavenger
chemotrophic
facultative
obligate
anabolism
endothermic
catabolism
exothermic
spontaneous generation
Francesco Redi
Robert Hooke
Antonius van Leeuwenhoek
Robert Brown
M. J. Schleiden
Theodor Schwann
Brownian movement
division of labor
differntially permeable
colloidal suspension
dynamic equilibrium
adenosine monophosphate
adenosine diphosphate
adenosine triphosphate
basal metabolism
cell theory
mitochondria
plasma membrane
vacuole membrane
chloroplastid
cell wall
dissociation
permeability
impermeable
ion exchange
water balance
disaccharide
monosaccharide
polysaccharide
fatty acid
pernicious anemia
pantothenic acid
ascorbic acid
heterotrophic
equilibrium
amino acid
nucleic acid
nucleoprotein
continuous phase

Unit 4. Chordate Organization - Structure and Function

I. Cells

A. Membrane
  1. Porosity
  2. Fatty constituents
  3. Electrical charges
  4. Passage of materials
B. Cell wall
  1. Chemical composition - lignin, suberin, cellulose
  2. Structure - permeable, nonliving
C. Cytoplasm
  1. Mitochondria and oxidative enzymes
  2. Plastids, chloroplasts, pigments
  3. Vacuoles
  4. Centrioles
D. Nucleus
  1. Chromatin
  2. Nucleoli

II. Tissues

A. Epithelial
B. Supporting and connective
C. Nervous

Unit 4. Chordate Organization - Structure and Function (Continued)

- D. Contractile
- E. Reproductive

III. Specializations

IV. Vertebrate skeleton

- A. Cranium
- B. Vertebral column
- C. Supporting structure
- D. Appendages
- E. Disorders

V. Muscular system

- A. Types of muscles
- B. Response
- C. Disorders

VI. Integumentary system

- A. Temperature control
- B. Skin
- C. Specializations
  - 1. Scales, nails, claws, and hoofs
  - 2. Hairs and feathers
  - 3. Teeth
- D. Disorders

VII. Digestive system

- A. Buccal cavity to stomach
  - 1. Structure
  - 2. Function
- B. Stomach
  - 1. Structure
  - 2. Function
- C. Intestines - structure and function
  - 1. Small
  - 2. Large
- D. Liver and Pancreas
  - 1. Structure
  - 2. Function
- E. Disorders
- F. Coelom - advantages and disadvantages

VIII. Respiratory system

- A. Gills
- B. Lungs
  - 1. Mouth pump
  - 2. The diaphragm
  - 3. Respiration in high altitudes
  - 4. Transportation of gases
  - 5. Acessory structures

Unit 4. Chordate Organization - Structure and Function (Continued)

IX. Circulatory system

- A. Blood vessels
- B. Heart
    - 1. Structure
    - 2. Evolution of heart and blood vessels
    - 3. Function
- C. Lymph system
- D. Blood
    - 1. Corpuscles - form and function
    - 2. Clotting mechanism
    - 3. Plasma - components and functions
    - 4. Immunity
    - 5. Blood groups
    - 6. Artificial blood
- E. Disorders

X. Excretory system

- A. Organs
    - 1. Kidneys - structure and function
    - 2. Bladder
    - 3. Sweat glands
    - 4. Liver
    - 5. Lungs
- B. Functions
    - 1. Deamination and detoxification
    - 2. Getting rid of nitrogenous wastes
    - 3. Continuity
- C. Problems

Vocabulary and Terms

tissue
organ
system
epithelial
glandular
squamous
cuboidal
columnar
ligament
tendon
cartilage
bone
adipose
chromatophore
neuron
contractile
myofibril
notochord
cephalization
viscera
coelom

pelagic
cranium
vertebrae
joint
hinge
gliding
suture
condyle
atlas
axis
cervical
thoracic
lumbar
ca[illegible]
spiracle
sternum
pectoral
pelvic
humerus
radius
metacarpal

phalange
femur
patella
tibia
fibula
tarsal
metatarsal
shaft
girdles
scapula
clavicle
ilium
ischium
pubis
origin
insertion
belly
flexor
biceps
extensor
gastro[illegible]

skeletal
voluntary
striated
visceral
involuntary
triceps
unstriated
cardiac
syncytium
fatigue
tetanus
integument
sebaceous
epidermis
dermis
carotene
melanin
parallelism
gut
mesentery
peritoneum

muscle fiber
somatic germ cell
axial skeleton
appendicular skeleton
ball-and-socket
linea alba
linea nigra
all-or-none
oxygen debt
muscle tone
sweat gland
hydrochloric acid
gall bladder
bile duct
bile salt
vermiform appendix
elastic recoil
pressure breathing
vacuum breathing
vital capacity

Unit 4. Chordate Organization - Structure and Function (Continued)

incisor
canine
premolar
molar
bicuspid
dentition
cuspid
bolus
gizzard
peristalsis
ptyalin
maltose
rennin
pepsin
protease
chyme
pyloric
pylorus
cardiac
colon
villi
rectum
duodenum
pancreas
liver
jejunum
sphincter
ileum
mucus
bile
lacteal
lumen
jaundice
cholesterol
gallstone
invertase
maltase
lactase
amylase
lipase
proteolytic
lipolytic
amylolytic
cecum
cloaca
ulcer
gill
glottis
epiglottis
trachea
larynx
intercostal
residual
tidal
diaphragm
pleural
abdominal
pericardium
erythrocyte
spleen
bronchi
bronchioles
alveoli
palate
pneumothorax
carotid
brachial
mesenteric
iliac
caudal
coronary
jugular
auricle
ventricle
pacemaker
systole
diastole
lymph
lymphatics
edema
thrombosis
stenosis
plasma
leucocytes
platelet
bicarbonate
anemea
hemolysis
lymphocyte
phagocyte
fibrin
clot
serum
proventriculus
oxyhemoglobin
arteriosclerosis
hypertension
anticoagulants
heparin
hormone
antibody
opsonin
agglutinin
lysin
preciptin
antitoxin
antigen
immune
toxoids
vaccination
antivenin
serology
Rh factor
anaphylaxis
allergies
deamination
detoxification
kidney
ureter
urethra
varicose
thrombus
hemophilia
urinary bladder
buffering mechanism
pleural membrane
vocal cord
dorsal
aorta
renal artery
portal system
hepatic portal
renal vein
hepatic vein
renal portal
sinus venosus
vena cava
ventral aorta
pulmonary vein
aortic arch
pulmonary artery
systemic circulation
pulse pressure
open circulation
blood capillary
lymph capillary
thoracic duct
lymph mode
angina pectoris
active immunity
passive immunity
blood group
renal corpuscle
Wolffian ducts
closed circulation

Unit 5. Other Multicellular Animals

I. Porifera

A. Colonies of cells
B. Degree of division of labor

II. Coelenterata

A. Form and structure
  1. Body plan
  2. Cell specialization
  3. Regeneration
  4. Alternation of generation
  5. Polymorphism
B. Classification

III. Platyhelminthes

A. Form and structure
  1. Symmetry
  2. Cephalization
  3. Triploblastic - characteristics

Unit 5. Other Multicellular Animals (Continued)

    4. Tissues, organs and systems
B. Free-living vs. parasitism
C. Classification
D. Examples of life histories

IV. Roundworms and relatives

A. Form and structure
B. Evolutionary advancements
C. Free-living vs. parasitism
D. Classification
E. Examples of typical life histories

V. Annelida

A. Form and structure
B. Evolutionary advancements
    1. Coelon
    2. Circulatory system
    3. Segmentation
    4. Excretory structures
C. Classification

VI. Mollusca

A. Form and structure
    1. Skeleton
    2. Visceral mass
    3. Organ of locomotion
B. Fundamental life processes
C. Classification
D. Typical life histories

VII. Arthropoda

A. Form and structure
    1. Serial homology
    2. Exoskeleton - advantages and disadvantages
    3. Adaptive radiation
B. Habitats and habits
    1. Types of mouth parts
    2. Interest to man
    3. Social organization
C. Classification
D. Life cycles and development

VIII. Echinodermata

A. Form and structure
B. Classification

Vocabulary and Terms

colony
sessile
spicule
matrix
flagellum
mesoglea
ectoderm
endoderm
buds
nematocyst
dimorphic
polymorphism
mesoderm
ganglion
regeneration

Unit 5. Other Multicellular Animals (Continued)

sucker
fluke
Taenia
scolex
neck
vagina
uterus
testis
setae
septa
crop
vessel
egg sac
capsule
palps
leech
lumen
mollusk
mantle
radula
clam
umbo
valve
gills
gonad
auricle
sinuses
chiton
cornea
iris
lens
retina
molt
chitin
antenna
trachea
thorax
telson
uropod
bailer
ostia
facet
insect
labium
coxa
tibia
tarsus

Trematoda
ciliated
rotifer
nematode
hookworm
trichina
esophagus
gizzard
submucosa
hirudin
ventricle
gastropod
pelecypid
cephalopod
arthropod
abdomen
ocellus
peripatus
haemocoel
carapace
rostrum
biramous
exopodite
cheliped
statocyst
labium
prothorax
pulvillus
foregut
midgut
hindgut
spiracles
tympanum
nymph
naiad
pupa
heparin
hypoxia
Thysanura
Isoptera
Odonata
Diptera
Anoplura
Hompptera
Hemiptera
Chilopoda
Diplopoda

aschelminth
planarian
proglottid
triploblastic
oviduct
Turbellaria
gastrotrich
nematomorph
microfilaria
oligochaete
prostomium
peristomium
nephridiopore
nephridium
nephrostome
chloragen cell
slime tube
polychaete
parapodia
trochophore
hermaphrodite
dessication
amphineurid
exoskeleton
crustacean
cephalothorax
swimmerets
protopodite
endopodite
antennule
maxilliped
gastric mill
gastrolith
sternal sinus
hemocyanin
green glands
tactile hair
ommatidium
hypopharynx
mesothorax
metathorax
trochanter
pneumothorax
Orthoptera
Ephemerida
Siphonaptera
Lepidoptera

pore cell
collar cell
T-shaped cell
gland cell
sensory cell
intersititial cell
gastrovascular cavity
nerve cell
sensory-neuromotor
nerve cord
alternation of generation
eye spot
genital pore
flame cell
intermediate host
sperm duct
yolk gland
six-hooked embryo
bladder worm
excretory duct
pseudocoel ascaris
vas deferens
seminal vesicle
ejaculatory duct
seminal receptacle
calciferousgland
median dorsal vessel
median ventral vessel
subneural vessel
parietal vessel
visceral peritoneum
peristomial tentacles
coelomic fluid
visceral mass
ventral muscular foot
mantle lobe
mantle cavity
incurrent siphon
excurrent siphon
anterior adductor

genital duct
veliger larva
convergent evolution
acanthocephalid
circumpharyngeal
copulatory
compound eye
homologous structure
serially homologous
first maxillae
second maxillae
salivary glands
gradual metamorphosis
residual air
book lung
gill books
spinnerets
sexual dimorphism
echinoderm
water vascular system
oral surface
aboral surface
pedicellariae
ambulacral groove
pedidermal branchiae
madreporite
nerve ring
radial nerves
tube feet
Ophiurioidea
Echinoidea
Holothurioidea
Crinoidea
posterior adductor
pericardial cavity
cerebral ganglia
visceral ganglia
Hymenoptera
Lepidoptera
Arachnoidea
disc
ray
ampulla
cerci
caeca
penis

Unit 6. Integrative Systems in Sense Organs - Behavior

I. Endocrine system

  A. Pituitary gland - location and function
  B. Thyroid gland - location and function
  C. Parathyroid glands - location and function

Unit 6. Integrative Systems in Sense Organs - Behavior (Continued)

- D. Adrenal glands - location and function
- E. Isles of Langerhans - location and function
- F. Mucosa hormones
    - 1. Where manufactured
    - 2. Functions
- G. Gonadal hormones - function
    - 1. Sexual cycle
    - 2. Maleness vs. femaleness
- H. Amphibian hormones
    - 1. Metamorphosis
    - 2. Feedback

II. Multicellular non-chordate coordination

III. Nervous systems

- A. Structure
    - 1. Microscopic neuron - afferent, efferent and associative
    - 2. Gross
        - a. Central - vertebrate and invertebrate
            - (1) Brain
            - (2) Nerve cord
        - b. Peripheral
            - (1) Cranial
            - (2) Spinal
        - c. Autonomic
        - d. Simple
- B. Functions
    - 1. Stimulus and response
    - 2. Simple circuit
        - a. Reflex arc
        - b. Synapse
    - 3. Complex circuit
        - a. Physical nature
        - b. Chemical nature
- C. Defects

IV. Sense organs - structure and functions

- A. Affectors
    - 1. Types - seeing, hearing, balancing
    - 2. Defects
- B. Effectors
    - 1. Glands
    - 2. Luminescent organs
    - 3. Electric organs
    - 4. Chromatophores
- C. Learning
- D. Conditioned reflex
- E. Frustration

V. Disorders

Unit 6. Integrative Systems in Sense Organs - Behavior (Continued)

endocrine
hormone
pituitary
thyroid
adrenal
adrenal
gigantism
insulin
diabetes
mellitus
secretin
estrogen
cretinism
prolactin
FSH
LH
ATCH
putressin
oxytosin
stimulus
response
threshold
nerve
neuron
dendrite
axon
receptor
effector

synapse
duration
afferent
efferent
cornea
choroid
pupil
iris
rhodopsin
retinene
cataract
ommatidia
facets
pinna
malleus
incus
stapes
cochlea
utriculus
sacculus
perilymph
endolymph
pitch
intensity
lagena
columella
statocyst
luciferin

dwarfism
thyroxism
cortisone
androgens
adrenalin
feedback
frequency
resolution
sclera
luciferase
cephalic
cerebrum
cerebellum
pons
forebrain
midbrain
hindbrain
epiphysis
sympathin
thalamus
cortex
frontal
parietal
occipital
temporal
sympathetic
vogus
maturation

orientation
reflex
instinct
insight
inhibitin
frustration
neuroses
facilitation
diencephalon
chromatophore
electrochemical
hypothalamus
corticalization
parasympathetic
cholinesterase
anthropomorphism
parathyroids
castration
thyrotrophic
luteinizing
testosterone
progesterone
implantation
gonadotrophin
thyrotrophin
coticotrophin
neurohumor
chemoreceptors

neurolemnia
photoreceptors
tonoreceptors
endocrinology
hypertrophied
hypothyroidism
hyperthyroidism
adrenocorticotrophic
infundibulism
ventricles
tangoreceptors
thermoreceptors
conjunctiva
accommodation
astigmatism
Eustachian tube
discrimination
equilibration
postural relationship
semicircular canals
follicle stimulating
far-sightedness
near-sightedness
transmission deafness
vitreous humor
kinetic response
cerebral hemisphere
sciatic plexus

Unit 7. Acellular Organisms

I. Nucleated

A. Sarcodina - habitats, nutrition, structure, function, method of locomotion, respiration, excretion, reproduction, behavior, classification interest to man, examples

B. Ciliata - habitats, nutrition, structure, function, method of locomotion, respiration, excretion, reproduction, behavior, classification, interest to man, examples

C. Mastigophora - habitats, nutrition, structure, function, method of locomotion, behavior, classification, examples, interest to man

D. Sporozoa - life cycle of plasmodium, classification, interest to man

E. Suctoria - general characteristics, classification

F. Yeasts - habitats, nutrition, structure, function, reproduction, classification, interest to man

G. Chrysophyta - habitats, nutrition, structure, function, classification interest to man

H. Chlorophyta - habitats, nutrition, structure, function, classification interest to man

Unit 7. Acellular Organisms (Continued)

II. Non-nucleated

A. Schizomycophyta - habitats, nutrition, kinds, structure, reproduction, classification, interest to man

B. Rickettsiae - general characteristics, classification, interest to man

C. Viruses - general characteristics, classification, interest to man

III. Connection with community health

A. Disease control
B. Food and water supplies
C. Garbage and sewage

Vocabulary and Terms

nucleated
Sarcodina
pseudopodia
endoplasm
ectoplasm
pellicle
protozoan
cosmopolitan
cyst
organelles
acellular
holozoic
saprophytic
holophytic
plasmalemma
nucleus
cytoplasm
plasmagel
plasmasol
granules
cilium
Ciliata
gullet
trichocyst
macronucleus
micronuclei

anal pore
asexual
sexual
autogamy
Mastigophora
Euglena
pyrenoid
chloroplast
colonial
symbiosis
flagellum
stigma
Sporozoa
malaria
spore
sporozite
merozoite
oocyst
trophozoite
Volvox
trypanosome
Trichonympha
Amoeba
Entamoeba
Balantidium
Opalina

Didinium
Stentor
Vorticella
Stylonychia
Euplotes
Plasmodium
Ascomycetes
ascus
ascospores
budding
Eumycophyta
Chrysophyta
diatom
Chlorophyta
Protococcus
bacteria
micron
coccus
bacillus
spirillum
pathogens
fungi
diplococci
streptococci
staphylococci
sarcina

autotrophic
heterotrophic
chemosynthesis
ultra-violet
infrared
fermentation
putrefaction
decay
assimilation
ammonification
nitrification
denitrification
carbon dioxide
rickettsia
zoonoses
virology
bacteriophage
bacteriolysis
isolation
quarantine
disinfection
botulism
germ theory
abiogenesis
bigenesis
filterable virus

food vacuole
contractile vacuole
binary fission
oral groove
mouth pore
paramecia types
euglenoid movement
trophic phase
encysted phase
female gametocyte
male gametocyte
ascogenoces hypha
plus strain
minus strain
diatomaceous earth
Schizomycophyta
bacteriologist
Eubacteriales
slime layer
diffuse nucleus
hydrogen ion concentration
nitrogen-fixation
intracellular parasite

Unit 8. Multicellular Thallophytes and Bryophytes

I. Multicellular thallophytes

A. Cyanophyta - habitats, nutrition, structure, reproduction, classification, interest to man

B. Chlorophyta - habitats, nutrition, structure, reproduction, classification, interest to man

C. Phaeophyta - habitats, classification, interest to man

D. Rhodophyta - habitats, classification, interest to man

Unit 8. Multicellular Thallophytes and Bryophytes (Continued)

E. Eumycophyta
  1. Phycomycetes - habitats, nutrition, structure, reproduction, classification, interest to man

  2. Ascomycetes - habitats, nutrition, structure, reproduction, classification, interest to man

  3. Basidiomycetes - habitat, nutrition, structure, reproduction, classification, interest to man

F. Lichens - nature, interest to man

G. Myxomycophyta - life history, classification, interest to man

II. Bryophyta

  A. Hepaticae - habitat, nutrition, structure, functions, life cycle, classification, interest to man

  B. Musci - habitat, nutrition, structure, life cycle, classification, interest to man

Vocabulary and Terms

thalli
Nostoc
zygote
gamete
kelp
Fucus
algins
stolon
aecium
lichen
embryo
Musci
moss
neck
venter
stalk
foot
seta
capsule
tetrad
gemma

habitat
filament
glycogen
plankton
zoospore
isogamete
Ulothrix
Spirogyra
bladders
Chlorella
mycelium
Rhizopus
rhizoids
progamete
suspensor
basidia
septate
conidia
spermatia
crustose

Saragassum
Rhodophyta
agar-agar
binucleate
uredospore
teliospore
aeciospore
foliose
fruticose
soredia
mutalism
plasmodium
Bryophyta
liverwort
paraphyses
operculum
peristome
protonema
ontogeny
phylogeny

Cyanophyta
phycocyanin
phycoerythrin
Gloeocapsa
Oscillatoria
Chlamydomonas
zoosporangium
gametangium
Oedogonium
oogonium
antheridium
fertilization
heterogamous
conjugation
fucoxanthin
Laminaria
phycoerythrin
Rhycomycetes
sporangiophore
Basidiomycetes

Phaeophyta
sporophyte generation
gametophyte generation
basidiospore
spermagonia
Myxomycophyta
protoplast
swarm spores
dichotomous
Hepatical
Embryophyta
dorsiventral
Polytrichum
neck canal cells
ventral canal cells
spore mother cell
recapitulation
fragmentation
calyptra
alginate

Unit 9. Tracheophyta

I. Organization

  A. Tissues
    1. Permanent - parenchyma, collenchyma, sclorenchyma
    2. Meristematic
  B. Organs
    1. Roots
      a. External structure

Unit 9. Tracheophyta (Continued)

- (1) Root cap
- (2) Root hairs
- b. Internal structure
  - (1) Stele
  - (2) Cortex
- c. Patterns
  - (1) Normal and adventitious
  - (2) Symbiotic relatioship
- d. Interest to man
- 2. Stems
  - a. Patterns of growth
  - b. External structure
  - c. Internal structure
    - (1) Monocotyledon
    - (2) Dicotyledon - herbaceous and woody
  - d. Buds - structure, function, and type
  - e. Interest to man
- 3. Leaves
  - a. External structure
  - b. Internal structure
    - (1) Epidermis
    - (2) Mesophyll
    - (3) Veins
  - c. Photosynthesis
  - d. Respiration
  - e. Transpiration - changes in leaf shape and position
  - f. Guttation
  - g. Arrangement
  - h. Interest to man
- 4. Specialized organs and organisms
  - a. Thorns and spines
  - b. Hold-fast structures
  - c. Underground stems
  - d. Modified roots
  - e. Carnivorous plants

II. Continuity

- A. Tissues and organs - root pressure, ascent and descent of sap, balance, air spaces, storage
- B. General growth habits - continued, secondary, annual rings, and leaf fall

III. Chemical coordination - tropisms, hormones, inhibitors, root formation, abnormal growth, circumnutation, nastic movement, photoperiodism, turgor, responses to contact and light, etiolation

IV. Modern Tracheophytes

- A. Psilopsida
  - 1. General characteristics
  - 2. Interest to man
- B. Lycopsida
  - 1. General characteristics
  - 2. Life cycle of Selaginella, Gametophyte and Sporophyte generation

Unit 9. Tracheophyta (Continued)

- 3. Heterosporous forms
- 4. Interest to man
- C. Sphenopsida
  - 1. General characteristics
  - 2. Interest to man
- D. Pteropsida
  - 1. Filicineae
    - a. General characteristics
    - b. Life cycle of Polypodium, Gametophyte and Sporophyte generations
    - c. Homospory
    - d. Interest to man
  - 2. Gymnospermae
    - a. General characteristids
    - b. Life cycle of Pinus, Gametophyte and Sporophyte generations
    - c. Cycadales - general characteristics (Cycadales)
    - d. Ginkgoales - general characteristics
    - e. Interest to man
  - 3. Angiospermae
    - a. General characteristics
    - b. Life cycle of Gametophyte and Sporophyte generations
    - c. Interest to man

Vocabulary and Terms

vascular
parenthyma
meristem
fiber
xylem
phloem
tracheid
vessel
cork
organ
root
pericycle
cortex
endodermis
ray
elongation
pith
lenticel
primordia
gape
node
internode
alternate
opposite
whorled
rosette

phyllotaxy
stipule
petiole
vein
blade
midrib
palisade
spongy
cyclosis
stoma
mesophyll
cutin
continuity
absorption
guttation
perennial
rhizome
biennial
annual
dicot
bark
heartwood
sapwood
tree
shrub

herb
cotyledon
bract
apical
leaflet
palmately
pinnately
rachis
indentation
parallel
netted
pinnate
protoderm
reticulate
pitted
collateral
steli
fusiform
suberin
adventitious
Psilopsida
lycopsids
sporophyll
megaspores
pith ray

pteropsids
strobili
quadrants
Equisetum
Filicineae
ramenta
indusia
annulus
cycad
Ginkgoales
Coniferales
fascicles
meiosis
generative
nucellus
integument
micropyle
pollination
auxin
tropism
callus
etiolation
turgor
root hair
guard cell

Tracheophyta
chlorenchyma
sieve tube
collenchyma
sclerenchyma
differentiation
plasmodesmata
leaf fall
interfascicular
Selaginella
Lycopodium
microspores
sphenopsids
heterosporous
homosporous
microsporophyll
prothallial cell
microgametophyte
megagametophyte
lip cell
phytohormones
parthenocarpy
nastic movement
photoperiodism
circinate venation

Unit 10. Growth and Development

- I. Growth
  - A. Cell duplication

Unit 10. Growth and Development (Continued)

    1. Mitosis - prophase, metaphase, anaphase, telophase, interphase
    2. Cell division in plants
    3. Cell division in animals
    4. Chromosomes
    5. Function of the nucleus
  B. Factors affecting growth - cell size and cell number
  C. Differentiation of cells
  D. Regeneration of cells
  E. Abnormalities of cells - cancer
  F. Degeneration of cells - death

II. Development of organisms

  A. Germplasm
  B. Animal embryos
    1. Fertilization
      a. Egg and sperm
      b. Fertilization in Echinodermata
      c. Fertilization in Hydrozoa, Cestoda, and most members of Scyphozoa and Salientia
      d. Copulation
      e. Hermaphroditism
    2. Development
      a. Cleavage
      b. Blastula
      c. Gastrulation
      d. Neurulation
    3. Differentiation in embryo development
    4. Degree of development
    5. Organogeny
    6. Totipotency
    7. Food supply
    8. Fetus
    9. Metamorphosis
  C. Acessory embryonic structures
  D. Plant embryo
    1. General pattern of development
    2. Development of the gymnosperm
    3. Development of the angiosperm
    4. Reproduction history - staminate and carpellate parts
    5. Dormancy
    6. Dispersal

Vocabulary and Terms

mitosis
aster
cancer
death
imago
testa
ovule
carpel
anther
ovary
style

prophase
metaphase
chromatid
anaphase
telophase
nucleoli
centriole
neoplasm
staminate
ovulate
perfect

chromosome
interphase
centromere
metastasis
totipotent
germplasm
copulation
clitellum
urogenital
epididymis
cotyledon

cytokinesis
regeneration
archenteron
gastrulation
neurulation
holoblastic
Leguminosae
receptacle
dispersal
funiculus
synergids

multinucleate
astral ray
hermaphrodite
metamorphosis
pollen sacs
seed coat
vas deferens
Fallopian tubes
neural tube
vegetal pole
animal pole

2

Unit 10. Growth and Development (Continued)

stigma
pistil
petal
scrotum
semen
corolla
sepal
calyx
stamen
fruit
fetus
morulla
somite
zonary
filament
perianth
cleavage
blastula
gastrula
Rosaceae
Labiatae
dormancy
epicotyl
epiboly
epiblast
chorion
chalaza
placenta
gymnosperm
angiosperm
urogenital
blastocoel
blastopore
notochord
organogeny
fertilizin
blastomere
nectaries
Cruciferae
Compositae
imperfect
hypocotyl
blastodisc
blastocyst
fate-maps
delaminates
hypoblast
allantois
umbilical
discoidal
afterbirth
viviparous
oviparous
marsupium
antifertilizin
hyaluronidase
Ranunculaceae
Umbelliferae
polar nuclei
coelomic pouch
primitive streak
extraembronic
somatopleure
splanchnopleure
cotyledonary
ovovivparous
double fertilization

Unit 11. Causes of Heredity

I. Asexual reproduction

II. Sexual reproduction

- A. Theories of heredity
- B. Importance of sex
- C. Poloidy
- D. Meiosis
  - 1. In simple organisms - Chlamydomonas, Paramecium, Spirogyra, other algae, Rhizopus
  - 2. In multicellular animals
  - 3. In embryonic plants - Gymnospermae, Angiospermae
  - 4. In chance combinations

III. Statistics and heredity

IV. Simple inheritance - works of Gregor Mendel - dominance, back-cross, independence, alleles, blending

V. Sex determination - characteristics of chromosomes and genes

VI. Sex-linked inheritance

VII. Ordinary linkage

- A. Crossing over
- B. Chromosomae mapping

VIII. Mutation

IX. Polyploidy

X. Parthenogenesis - asexual, sexual?

XI. Practical applications - hybrid vigor, genetic improvement, human genetics influence of environment, artificial insemination, individuality

Unit 11. Causes of Heredity (Continued)

Vocabulary and Terms

cutting
rhizome
stolon
ploidy
haploid
diploid
alleles
gene
DNA
layering
synapsis
triploid
biometry
dominance
recessive
genotype
blending
mosaics
monoploid
phenotype
monohybrid
dihybrid
lethals
autosome
mutation
eugenics
papillae
cytogenetics
sporogenesis
segregation
independence
polyploidy
tetraploid
polyploid
heterosis
euthenics
underground stem
gametogenesis
random fertilization
heterozygous
incomplete cominance
ordinary linkage
crossing over
sex-linked
parthenogenesis

Unit 12. Abundance of Life and Habitats

I. Biotic potential

  A. Environmental resistance
  B. Adaptations

II. Adaptations in multicellular plants

  A. Leaves, stems, roots
  B. Defense
  C. Spore dissemination
  D. Pollen dissemination
  E. Seed dissemination - succulent fruit, dry fruit, indehiscent fruit, dehiscent fruit

III. Adaptations in multicellular animals

  A. For food - beaks, mammalian teeth, suckers, grappling hooks, collecting baskets, filters
  B. For finding and winning mates
  C. For providing for the young
  D. For concealment
  E. For defense and escape
  F. For mutualism, commensalism, parasitism
  G. For special functions - serial, gall

IV. Habitats and distribution

  A. Basic habitats - marine, littoral, fresh water, terrestrial, arid land, drought
  B. Biogeography - Australasian,Holarctic, Paleotropical and Neotropical Realm
  C. Life zones - Arctic-Alpine, Boreal, Austral, Tropical
  D. Alterations
    1. Succession - following volcanic activity, fire, and flood
    2. Escape - dormancy and migration
  E. Food chains
  F. Environmental resistance - bridges and barriers

V. Effects of life on environment

  A. Carbon cycle and nitrogen cycle

Unit 12. Abundance of Life and Habitats (Continued)

B. Stabilization by living organisms
C. Erosion influenced by living organisms

Vocabulary and Terms

berry
drupe
pome
grain
nut
pod
model
mimic
rumen
cud
casts
gall
weed
achene
samara
capsule
mimicry
realms
ecology
nekton
benthos
fruit
tundra
barrier
bridge
humus
fecundity
viability
autotomy
mutualism
plankton
emergent
mesophyte
epiphyte
succulence
estivation
camouflage
hibernate
migration
environmental
resistance
adaptation
mycorrhizae
parasitism
vermifuges
community
oceanology
limnology
hydrophytes
succession
periodicity
potential
phosphorus cycle
nitrogen cycle
carbon cycle
food chain
biogeography
hyperparasite
endoparasite
ectoparasite
commensalism
countershoding
sex ratio
population density
generation time

Unit 13. History of Life

I. Records in rock

A. Archeozoic Era
B. Proterozoic Era
C. Paleozoic Era
D. Mesozoic Era
E. Cenozoic Era

II. Time measurements

III. Fossils - kinds and histories

Vocabulary and Terms

igneous
fossil
casts
petrified
coprolite
gastrolith
sedimentary
unconformity
Cenozoic Era
Archeozoic Era
Mesozoic Era
Eocene period
Pleistocene period
paleontologist
Miocene period

Unit 14. Problem of Life - Looking Toward the Future

I. Problem of life itself

A. Inferences
   1. Embryological - indirections, unused organs, parallelism
   2. From comparative anatomy - homologies, vestigial organs
   3. From comparative physiology - interchangeability, serology, comparable pigments, susceptibility to disease, salt content in the blood
   4. Biogeographical - Wallace line, island life
   5. From genetics - selection under domestication, natural factors, interspecific crosses, polyploids

B. General deductions
   1. Special creation
   2. Evolution through use or disuse

Unit 14. Problem of Life - Looking Toward the Future (Continued)

        3. Evolution through survival of the fittest and natural selection
        4. Evolution through natural selection of charaters inherited through cytoplasm
        5. Evolution through natural selection of mutations
    C. Modern synthesis
        1. Origin of life and of phyla
        2. Trees of descent - divergence
        3. Biological inventions
            a. Localization and chemical reaction
            b. Multicellular advantages
            c. Sexual reproduction
    D. Interpreting the fossil record
        1. Climatic effects
        2. Nonadaptive characters
        3. Overspecialization
        4. Adaptations which are terminal
        5. Embryonic similarities - Theory of Recapitulation
    E. Man's development
        1. Cultural - Eolithic, Paleolithic, Mesolithic, Neolithic
        2. Fossil
        3. Pre-historic - Homo africanus, Homo erectus
        4. Recent Homo sapiens - Australoid, Caucasioid, Negroid, Mongoloid
        5. Present - population

II. Future look

    A. Probable course of man
    B. Environmental resistance
        1. Disease control - organizations and their results
        2. Water supply - pollution, water sheds
        3. Food
            a. Plant crops
                (1) Necessities - water, soil, oxygen,in soil
                (2) Problems - metallic poisons, protection from attack, competitory weeds
            b. Animal crops
                (1) Domesticated birds
                (2) Domesticated mammals
                (3) Wild animals
            c. Water crop
                (1) Water areas of earth
                (2) Potential development
                    (a) Artificial propagation
                    (b) Varieties
                (3) Potential problems
                    (a) Overfishing
                    (b) Barriers - natural and man-made
                    (c) Predators
    C. Resources for the future
    D. Problems for the future
        1. Poisons, narcotics, and stimulants
        2. Dangerous animals
        3. Radiations
    E. Biotic potential

Unit 14. Problem of Life - Looking Toward the Future (Continued)

1. Indirect outlets - trees, seals, whales, native birds, native mammals, and native plants
2. Direct outlets - future populations, quality, and supremacy of man

F. The driving force

Vocabulary and Terms

atavism
homology
serology
artifact
Eolithic
Negroid
WHO
soil
analogous
evolution
Paleolithic
Mesolithic
Neolithic
character
narcotics
supremacy
indirection
parallelism
parabiosis
divergence
convergence
Causasoid
livergence
demography
Australoid
Mongoloid
conservative
conservation
pollution
epizootics
overfishing
unused organ
serial homology
interchangeability
overspecialization
Homo sapien
catastrophism
replacement control
cutoff water
T. R. Malthus

LABORATORY EXPERIENCES

Unit 1. Introduction to Laboratory Work

Unit 2. Methods of Identifying Organisms Through the Use of Keys

I. General technique in use of keys

II. General survey of plant and animal kingdoms

III. Identifying common trees - checklist of genera of common trees

IV. Identifying vertebrates

Vocabulary and Terms

key
blade
apex
nodes
axil
lobe
awl
sessile
micrib
margin
acute
ovate
obtuse
cloaca
lateral
pinnate
palmate
ternate
serrate
sinuses
rhachis
axillary
terminal
undulate
alternate
spiracle
operculum
marsupium
unicellular
multicellular
internode
lancelate
deciduous
persistent
cold-blooded

Unit 3. Comparative Study - Fetal Pig and Man

I. External anatomy

A. Head
1. Mouth
    a. Tongue - papillae
    b. Teeth - milk dentition
    c. Gums
    d. Palate - hard, soft
2. Pharynx
    a. Eustachian tube

Unit 3. Comparative Study - Fetal Pig and Man (Continued)

        b. Epiglottis
        c. Glottis
      3. Jaws
      4. Lips
      5. Snout
      6. Nostrils
      7. Eyes
        a. Nictitating membrane
        b. Eyelashes
        c. Lids
        d. Eyeballs
      8. Ears
        a. Auditory canal
        b. Pinna
    B. Trunk
      1. Regions - pectoral, pelvic, thoracic, abdominal
      2. Special structures
        a. Mammary glands - nipples
        b. Umbilical cord - veins and arteries
        c. Anus
        d. Urogenital opening - vulva, clitoris
        e. Neck
    C. Appendages - legs
      1. Digits - hoofs
      2. Heel

II. Skeleton

    A. Axial
      1. Skull - cranium, mandible, sutures
      2. Vertebral column
        a. Intervertebral discs
        b. Vertebrae
          (1) Cervical - atlas, axis
          (2) Thoracic
          (3) Lumbar
          (4) Sacral
          (5) Caudal
        c. Ribs - true, false, floating, costal cartilages
        d. Sternum
    B. Appendicular
      1. Pectoral girdle - clavicle, scapula
      2. Pectoral appendages - humerus, ulna, radius, carpals, metacarpals, phalanges
      3. Pelvic girdle - ilium, pubis, ischium
      4. Pelvic appendages - femur, tibia, fibula, tarsals, metatarsals, phalanges

III. Respiratory and endocrine organs

    A. Neck
      1. Thymus gland
      2. Larynx - vocal cords
      3. Trachea - cartilaginous rings

Unit 3. Comparative Study - Fetal Pig and Man (Continued)

    4. Esophagus
    5. Thyroid gland
    6. Parathyroids
  B. Thorax
    1. Pleura
    2. Trachea
    3. Bronchi
    4. Lungs - bronchioles, alveoli

IV. Abdominal cavity and gut

  A. Organs
    1. Coelom - peritoneum
    2. Viscera
      a. Diaphragm
      b. Liver - gall bladder, and the bile duct
      c. Mesenteries
      d. Stomach
        (1) Regions - cardiac and pyloric
        (2) Valves
      e. Intestines
        (1) Small
          (a) Duodenum - lumen, villi, mucosa, submucosa, circular muscles, longitudinal muscles, serosa
          (b) Jejunum
          (c) Ilium
        (2) Large - colon, cecum, rectum
      f. Spleen
      g. Pancreas
      h. Reproductive organs
  B. Functions - digestion, absorption, and reproduction

V. Comparison of guts - pig, man, and frog

  A. Trunk length
  B. Mouth and pharynx
  C. Esophagus
  D. Stomach
  E. Small intestine
  F. Cecum
  G. Colon
  H. Rectum

VI. Circulatory organs

  A. Heart - apex, base, auricle, ventricle, valves
  B. Arteries
    1. Major thoracic - coronary, carotid, aorta, ductus arteriosus, pulmonary, subclavian, brachiocephalic
    2. Major abdominal - coeliac, anterior mesenteric, posterior mesenteric, renal
    3. Major appendicular - external iliac, caudal, internal iliac, umbilical
  C. Veins - coronary, internal jugular, precaval, external jugular, subclavian, innominate, postcaval, pulmonary, azygous, ductus venosus, gastric, mesenteric, hepatic

Unit 3. Comparative Study - Fetal Pig and Man (Continued)

VII. Blood

A. Plasma
B. Formed elements - erythrocytes, leucocytes, platelets

VIII. Urogenital organs

A. Both sexes - hilus, adrenal gland, urinary bladder, ureter
B. Male fetal pig - scrotum, inguinal canal, testis, epididymis, vas deferens, seminal vesicles, prostate gland, urethra, urogenital canal, Cowper's gland, penis, spermatic cord
C. Female fetal pig - uterus, horns of the uterus, fallopian tube, ovary, urethra, vagina

IX. Nervous system - gross structure

A. Central
  1. Brain - cerebrum, cerebellum, medulla oblongata, pons, pituitary body, optic chiasma, corpus callosum, pineal body
  2. Cord
B. Peripheral
  1. Cranial - optic and olfactory
  2. Spinal - brachial plexus, sacral plexus
C. Autonomic

X. Sense organs

A. Eye
  1. Socket
  2. Muscles
  3. Eyeball - pupil, lens, ciliary body, sclera, cornea, retina, blind spot, choroid layer, iris
  4. Conjunctiva
B. Ear
  1. Outer ear - tympanum
  2. Middle ear - bones and eustachian tube
  3. Inner ear - cochlea, semicircular canals, auditory nerve

Vocabulary and Terms

aorta
hilus
semen
ovary
pons
pupil
lens
snout
pinna
pelvic
thorax
anus
palate
lumbar

urine
plasma
venous
testis
hernia
medial
ureter
vagina
sclera
cornea
retina
pharynx
glottis
cranium

pectoral
placenta
papillae
mandible
vertebra
cervical
thoracic
clavicle
proximal
anterior
patella
sesamoid
trachea
thyroid

posterior
esophagus
diaphragm
mesentery
sphincter
submucosa
digestion
invertase
proteoses
thoracic
bronchi
alveolus
auricle
ventricle

aminopeptidases
umbilical
urogenital
dentition
Eustachian
epiglottis
esophagus
metacarpals
phalanges
metatarsals
cartilaginous
parathyroid
vocal cord
dissection

Unit 3. Comparative Study - Fetal Pig and Man (Continued)

sacral
caudal
atlas
axis
ulna
basal
radius
suture
ilium
dorsal
pubis
femur
tibia
thymus
bile
colon
cecum
apex

coccyx
scapula
sternum
humerus
carpals
ischium
tarsals
larynx
spleen
rectum
villus
mucosa
saliva
lipase
rennin
pepsin
casein
pleura

viscera
pylorus
cardiac
duodenum
pancreas
gastric
anylase
maltose
ptyalin
maltase
lactase
lactose
protease
peptones
protein
peptids
glycerol
girdle

leucocyte
platelet
arterial
scrotum
urethra
aperture
uterus
autonomic
gestation
cerebrium
cerebellum
pituitary
hemisect
choroid
tympanum
cochlea
auditory
epididymis

intervertebral cisc
peritoneum
peristalsis
polypeptids
emulsifying
dipeptidase
pericardium
bronchiole
brachiocephalic artery
hepatic portal system
nitrogenous
peripheral
erythrocyte
vas deferens
seminal vesicles
conjunctiva
semicircular canal
anterior mesenteric artery

Unit 4. Multicellular Animals

I. External features

- A. Hydra
  - 1. Morphology - size, symmetry, apertures
  - 2. Behavior - responses, food habits, adaptations
  - 3. Habitat
- B. Earthworm
  - 1. Morphology
    - a. Size
    - b. Symmetry
    - c. Apertures
      - (1) Mouth
      - (2) Anus
      - (3) Nephridiopores
      - (4) Genital
        - (a) Two seminal receptacles
        - (b) Two oviducts
        - (c) Two seminal vesicles
      - (5) Mid-dorsal pore
    - d. Setae
    - e. Prostomium
  - 2. Behavior - responses, food habits, adaptations
  - 3. Habitat
- C. Grasshopper
  - 1. Morphology
    - a. Size
    - b. General divisions - head, thorax, abdomen
    - c. Symmetry
    - d. Apertures - mouth (labium, labrum, mandibles, maxillae), anus, spiracles
    - e. Legs - coxa, trochanter, femur, tibia, tarsus
    - f. Wings - metathoracic, mesothoracic
    - g. Sense organs - ocellus, compound eye, pulp, antenna, cercus, tympanum
    - h. Ovipositor

Unit 4. Multicellular Animals (Continued)

II. Internal features

A. Earthworm
   1. Body wall - circular layer, longitudinal layer, cuticle, epidermis, and peritoneum
   2. Digestive system - coelom, septa, pharynx, esophagus, crop, gizzard, intestine (Typhlosole)
   3. Circulatory system - median dorsal vessel, median ventral vessel, hearts, subneural vessel, parietal vessels
   4. Excretory system - nephridium (Nephrostome), chloragen layer
   5. Nervous system - brain, subpharyngeal ganglion, circumpharyngeal connectives, ventral nerve cord
   6. Reproductive system - ovaries, oviducts, egg sacs, seminal receptacles, testes, seminal vesicles, Vasa Deferentia

B. Grasshopper
   1. Digestive system
      a. Foregut - pharynx, esophagus, crop, gizzard, mouth (salivary glands
      b. Midgut - stomach, gastric caeca
      c. Hindgut - large intestine, small intestine, rectum
   2. Circulatory system - heart, aorta (Ostia), pericardial sinus
   3. Excretory system - Malpighian Tubules
   4. Muscular system
   5. Nervous system - brain, subesophageal ganglion, circumesophageal connectives, nerve cord
   6. Reproductive system - ovaries, oviducts, vagina, seminal receptacle, testes, Vasa Deferentia, ejaculatory duct, penis
   7. Respiratory system - trachea, tracheole, air sacs

Vocabulary and Terms

ovary
bud
anus
seta
coxa
femur
tibia
palp
septa
caeca
ostia
sinus
penis
duct
sac

testis
genital
lateral
dorsal
ventral
habitat
labium
labrum
tarsus
cercus
coelom
median
midgut
tubule
vagina

symmetry
mandible
maxilla
spiracle
tympanum
pharynx
gizzard
parietal
foregut
hindgut
gastric
striated
trachea
antenna
oral end

hypostome
prostomium
clitellum
trocanter
ovipositor
esophagus
typhlosole
subneural
nephridium
chloragen
ganglion
salivary
tracheole
oviduct
aboral end

seminal receptacle
coelenterate
mesothoracic
metathoracic
mid-dorsal
calciferous
gastrovascular cavity
nephrostome
peritoneum
subpharyngeal
circumpharyngeal
pericardial
ejaculatory
seminal vesicle

Unit 5. Compound Microscope

I. Parts

A. Base
B. Pillar
C. Stage - clips
D. Arm

Unit 5. Compound Microscope (Continued)

E. Body tube
F. Coarse adjustment
G. Fine adjustment
H. Ocular
I. Nosepiece
  1. Low-power objective
  2. High-power objective
J. Diaphragm
K. Mirror

II. Use

A. General procedure
B. Interpretation - magnifications, sketching
C. Preparation of mounts

III. Care

Vocabulary and Terms

base
stage
arm
tube
pillar
imbed
focus
ocular
nosepiece
objective
fixative
coverslip
magnification
adjustment
dry mount
microtome
virtual image
set mount
section cutting
inclination joint

Unit 6. Organization of Acellular Organisms

I. Amoeba

A. Morphology
  1. Ectoplasm
  2. Endoplasm
  3. Pseudopodia - locomotion and food getting
  4. Vacuoles - food and contractile
  5. Nucleus
B. Reproduction
C. Behavior

II. Paramecium

A. Morphology
  1. Cilia
  2. Pellicle
  3. Oral groove
  4. Ectoplasm
  5. Trichocysts
  6. Endoplasm
  7. Vacuoles
    a. Food - mouth and gullet
    b. Contractile - radial canals and anal spot
  8. Nuclei - micronuclei and macronuclei
B. Reproduction - conjugation and fission
C. Behavior

III. Euglena

Unit 6. Organization of Acellular Organisms (Continued)

A. Morphology - ectoplasm, flagellum, pellicle, gullet and reservoir, eye spot, endoplasm, vacuole, nucleus, chloroplasts, pyrenoids, paramylum
B. Reproduction
C. Locomotion - Euglenoid movement
D. Behavior

IV. Protococcus

A. Morphology - cell wall, chloroplasts, chlorophyll
B. Reproduction - fission

V. Yeast

A. Morphology - cell wall, cytoplasm, vacuole
B. Reproduction - buds

VI. Bacteria

A. Morphology - cocci, bacilli, spirilla
B. Reproduction - fission
C. Locomotion - Brownian movement

Vocabulary and Terms

vacuole
nucleus
cilium
anal
fission
coccus
ectoplasm
endoplasm
pellicle
reservoir
pyrenoid
motile
flagellum
paramylum
euglenoid
cytoplasm
bacillus
spirillum
contractile
trichocyst
conjugation
chloroplast
Protococcus
morphology
cell membrane
oral groove
pseudopodium
micronucleus
macronucleus
Brownian movement

Unit 7. Organization of Multicellular Plants

I. Filamentous green alga - Spirogyra

A. Morphology - cell wall, chloroplast, pyrenoid, cytoplasm, vacuole, nucleus, cytoplasmic strands
B. Reproduction
    1. Asexual - fragmentation
    2. Sexual - conjugation
        a. Conjugation tube
        b. Isogametes
        c. Fertilization
        d. Zygote
        e. Zygospore

II. Alga-like fungus - Rhizopus

A. Morphology - hyphae, mycelium, rhizoids
B. Life cycle - alternation of generation
    1. Sexual reproductions
        a. Strains - minus and plus
        b. Progamete
        c. Zygospore

Unit 7. Organization of Multicellular Plants (Continued)

2. Asexual reproduction
    - a. Sporangiophore
    - b. Sporangium - columella, spores
    - c. Stolon

III. Moss - Polytrichum

- A. Morphology
    - 1. Gametophyte - stem, leaves, rhizoids
    - 2. Sporophyte - foot, seta
- B. Life cycle - alternation of generation
    - 1. Gametophyte reproduction
        - a. Male
        - b. Female
            - (1) Venter - egg, ventral canal cell, and neck canal cell
            - (2) Stalk
    - 2. Sporophyte reproduction
        - a. Parts in volved - capsule, operculum, calyptra, peristome
        - b. Product - spore, protonema

IV. Fern - Polypodium

- A. Morphology
    - 1. Sporophyte
        - a. Roots
        - b. Rhizome - epidermis, cortex, vascular bundles (xylem, phloem), pericycle, endodermis, pith
        - c. Fronds
    - 2. Gametophyte - thallus, rhizoids
- B. Life cycle
    - 1. Sporophyte reproduction - sporophylls
        - a. Spori
        - B. Sporangia - stalk, capsule, annulus and lip cells
        - c. Indusium
    - 2. Gametophyte reproduction - antheridia and archegonia

Vocabulary and Terms

vacuole
hyphae
venter
seta
frond
pinnae
sorus
cortex
xylem
phloem

pyrenoid
nucleus
mycelium
rhizoid
stolons
capsule
calyptra
rhizome
annulus
indusium
epidermis

zygospore
isogamete
substrate
sporangium
columella
progamete
operculum
peristome
sporophyll
protonema

gametophyte
sporophyte
saprophytic
antheridium
paraphysis
archegonium
prothallus
pericycle
endodermis
conjugation

filamentous
cytoplasmic strand
fragmentation
cell wall
sporangiophore
ventral canal cells
neck canal cell
chloroplast
fertilization
alternation

Unit 8. Cell Division

I. Mitosis

- A. Plant
    - 1. Interphase
        - a. Cell wall

Unit 8. Cell Division (Continued)

b. Plasma membrane
c. Cytoplasm
d. Sap vacuole - sap vacuole membrane
e. Mitochondrium
f. Plastid
g. Nucleus - nuclear membrane, nucleolus, chromatin
2. Prophase - chromosome formation, spindle fibril, poles, equatorial plate
3. Metaphase - duplication
4. Anaphase - chromosome movement, spindle fibril
5. Telophase
B. Animal
1. Interphase - plasma membrane, cytoplasm, mitochondrium, centriole, cuticle, nucleus
2. Prophase - division of centriole, aster, astral rays
3. Metaphase
4. Anaphase
5. Telophase

II. Meiosis

A. Plant
1. Mother cell - tetrads
2. First division - dyads
3. Second division - monads and haploid cells
B. Animal

III. Cytokinesis - plants and animals

Vocabulary and Terms

cuticle
aster
dyad
monad
haploid
mitosis
plastid
nucleus
prophase
anaphase
cytoplasm
nucleolus
metaphase
telophase
chromatin
synapsis
interphase
chromosome
cytokinesis
centriole
plasma membrane
mitochondrium
spindle fibril
astral ray
tetrads

Unit 9. Animal Embryo Development

I. Cleavage

A. Unfertilized egg
B. Fertilized egg
C. Two-cell stage
D. Four-cell stage
E. Eight-cell stage
F. Blastula - blastocoel

II. Gastrulation - archenteron, ectoderm, endoderm, blastopore

III. Germ layers - ectoderm, mesoderm, endoderm

IV. Organogeny - differentiation, development of hollow nerve cord, formation of notochord, development of blood vessels and heart

Unit 9. Animal Embryo Development (Continued)

V. Extra-embryonic membranes - chorio-allantoic membrane, amnion, amniotic fluid

Vocabulary and Terms

amnion
cleavage
blastula
gastrula
ectoderm
mesoderm
endoderm
gestation
embryonic
blastocoel
blastopore
organogeny
gastrulation
archenteron
inpocketing
outpocketing
germ layers
chorio-allantoic membrane

Unit 10. Asexual Reproduction

I. Fission - Paramecium - early, middle, late fission

II. Sporulation - Rhizopus, Plasmodium,

III. Vegetative reproduction

- A. By rhizomes - white potato and canna
- B. By bulbs - tulip and onion
- C. By roots - sweet potato
- D. By buds - yeasts and hydra
- E. By fragmemtation - Nostoc, Spirogyra, Oscillatoria, Ulothrix, Oedogonium, Sponge, planarian
- F. By leaves - Bryophyllum and Saintpanlia
- G. By stolons - strawberry and hawk weed
- H. By layering - raspberry and blackberry
- I. By grafts - fruit trees
- J. By cuttings - colias, geranium, willow, hydra, and planarian

IV. Gemmulation - sponge

V. Parthenogenesis (sexual or asexual?) - honeybees and aphids

Vocabulary and Terms

bulb
root
Nostoc
stolon
Colias
fission
Rhizopus
rhizome
budding
cutting
Spirogyra
Ulothrix
planarian
layering
grafting
sporulation
Plasmodium
vegetative
Oedogonium
gemmulation
fragmentation
Oscillatoria
Bryophyllum
Saintpaulia
parthenogenesis

Unit 11. Genetics

I. Problems

- A. Monohybrid crosses with complete dominance
- B. Monohybrid crosses with incomplete dominance
- C. Dihybrid corsses with complete dominance
- D. Multiple alleles
- E. Multiple factors
- F. Sex-linked inheritance

II. Blood typing

Unit 11. Genetics (Continued)

III. Human Inheritance

Vocabulary and Terms

hybrid
gene
zygote
genotype
alleles
Hemolet
dominance
phenotype
chromosome
heterozygous
P generation
agglutinate
monohybrid cross
sex-linked
saline solution

Unit 12. Fossils

I. Kinds of fossilization

A. Unaltered - peat, bone, shell, teeth, diatomaceous earth
B. Replacement - petrified wood, brachiopod shells
C. Molds
D. Imprints - plant and animal
E. Burrows
G. Gastroliths
H. Coprolites
I. Artifacts

II. Representative fossils

A. Simple plants - algae
B. Vascular plants - petrified wood, coal balls, bark imprints, peat
C. Protozoans - Foraminifera, Radiolaria
D. Sponges
E. Coelenterates - graptolites, solitary corals, colonial corals
F. Brochiopods - Lingula
G. Mollusks
    1. Bivalves - clams and oysters
    2. Gastropods - snail
    3. Cephalopods - nautiloid, nautilus
H. Arthropods - Trilobites, Eurypterids, xiphosuran, insects
I. Echinoderms - Crinoid
J. Chordates

Vocabulary and Terms

pyrites
debris
Miocene
Eocene
Permian
era
ooze
Lingula
bivalve
amber
crinoid
cystoid
Cenozoic
Mesozoic
Pliocene
Jurassic
Triassic
Devonian
Silurian
Cambrian
univalve
Limulus
lobefin
lungfish
silicified
Paleozoic
Oligocene
artifacts
petrified
gastropod
nautiloid
coprolite
trilobite
ammonoid
dinosaur
placental
Proterozoic
Archeozoic
Pleistocene
Cretaceous
Ordovician
geological
graptolite
brachiopod
cephalopod
eurypterid
xiphosuran
echinoderm
fossilization
diatomaceous
Pennsylvanian
Mississippian
coal ball
foraminiferous
radiolarian
lithographic
sea urchin
ostracoderm
cartilaginous
rhychoceopalian

Unit 13. Form and Function of Seed Plants

I. Life cycle of the pine - Gymnospermae

- A. Sporophytes
  - 1. Roots
  - 2. Stems
  - 3. Leaves
  - 4. Cones - spore formation
    - a. Staminate - axis, stalk, microsporophylls
    - b. Ovulate - megasporangium, integument, micropyle, megasporophylls
- B. Gametophytes
  - 1. Male - antheridial cell, prothallial cell, tube cell, generative cell
  - 2. Female - archegonia, egg cell, neck cells (fertilization)
- C. Seeds
  - 1. Development - cotyledons, hypocotyl, epicotyl, endosperm, integument
  - 2. Dissemination - Pinus, other gymnosperms
- D. Seedling development

II. Life cycle of the flowering plants - Angiospermae

- A. Sporophytes
  - 1. Roots
    - a. Kinds - primary, secondary, fibrous, tap, prop, adventitious, hold-fast, parasitic
    - b. Structure
      - (1) Primary
        - (a) Epidermis
        - (b) Cortex - parenchyma, endodermis
        - (c) Stele - phloem, xylem, pericycle, parenchyma
      - (2) Tip - cap, terminal meristem, zone of cell elongation, hairs, zone of maturation, vascular cylinder
  - 2. Stems
    - a. Dicotyledons
      - (1) Epidermis
      - (2) Cortex - parenchyma, endodermis
      - (3) Pericycle
      - (4) Vascular bundle - phloem, xylem, cambium, animal rings
      - (5) Ray
      - (6) Pith
    - b. Monocotyledons
      - (1) Epidermis
      - (2) Vascular bundle - phloem, xylem
      - (3) Parenchyma
  - 3. Leaves
    - a. External features - parts, venations, modifications
    - b. Internal features
      - (1) Epidermis - cuticle, stomata, guard cells
      - (2) Air spaces
      - (3) Mesophyll - palisade and spongy chlorenchyma
      - (4) Vascular bundles
      - (5) Pigments - anthocyanin, chlorophyll
    - c. Processes - photosynthesis, transpiration, respiration, translocation, growth

Unit 13. Form and Function of Seed Plants (Continued)

4. Flowers
a. Structure
(1) Pedicel
(2) Receptacle
(3) Calyx - sepals
(4) Corolla - petals
(5) Stamen - filament, anther
(6) Pistil - ovary, ovule, style, stigma
b. Types - regular, irregular, perfect, imperfect, pistillate, staminate, hypogynous, perigynous, epigynous
c. Inflorescences - spike, raceme, corymb, panicle, umbel, head
B. Gametophytes
1. Male - generative cell, tube cell, pollen tube
2. Female - egg cell, primary endosperm cell, fertilization
C. Fruits
1. Structure
2. Types
a. Simple
(1) Fleshy - drupe, berry, pome
(2) Dry
(a) Indehiscent - achene, grain, samara, nut
(b) Dehiscent - pod, capsule
b. Aggregate
c. Multiple
D. Seeds
1. Development
a. Monocotyledon
(1) Integuments
(2) Endosperm
(3) Embryo - cotyledon, hypocotyl, coleorhiza, epicotyl, coleoptile
b. Dicotyledon
(1) Hilum
(2) Micropyle
(3) Integuments
(4) Embryo - cotyledons, hypocotyl, epicotyl, radicle, plumule
E. Seedling development - hypocotyl, epicotyl, primary root, stem, branches, leaves, cotyledon

III. Pollination and mutual adaptations in insects

A. Self-pollination
B. Self-pollination - pollen transfer
1. Wind
2. Water
3. Honeybee
a. Head
(1) Eyes
(2) Mouth parts - mandibles, palps, labium, maxillae
b. Digestive tract
c. Legs - antenna comb, velum, pollen brush, pollen spur, pollen combs, auricle, pollen basket
d. Abdomen - wax scales, sting

Unit 13. Form and Function of Seed Plants (Continued)

Vocabulary and Terms

bark
bast
ovule
testa
calyx
cork
scar
pome
sepal
petal
ovary
style
fruit
palpi
velum
biotic
pith
xylem
stamen
sieve
pod
nut
anther
pistil
carpel
stigma
nectar
labium
tarsus
pecten
hilum
berry
drupe
achene
grain
samara
epidermis
cortex
phloem
cambium
sheath
mosaic
spongy
glucose
dilution
pedicel
corolla
filament
hemisect
compound
maxillae
auricle
epicotyl
capsule
endodermis
parenchyma
pericycle
palisade
stomata
diagnostic
megaspore
staminate
integument
micropyle
recepticle
mutualism
hypocotyl
cotyledon
dehiscent
fibrous
vascular
accessory
terminal meristem
photomicrograph
chlorenchyma
guard cell
anthocyanin
chlorophyll
photosynthesis
double fertilization
synthesize
microspore
silhouette
regurgitate
wax scale
coleopitle
coleorhiza
indehiscent
dissemination
transverse section

Unit 14. Identification, Recognition, and Classification of Some of the More Common Species of Organisms

I. Insects
II. Weeds
III. Reptiles
IV. Trees
V. Spiders
VI. Amphibians
VII. Mammals
VIII. Fish
IX. Shrubs
X. Birds
XI. Mollusks
XII. Plankton
XIII. Ferns
XIV. Bryophytes
XV. Multicellular fungi
XVI. Coelenterates

TESTING AND EVALUATION

Unit tests give students adequate opportunity to demonstrate their knowledge and understanding of biology. These tests consist of both objective and essay questions.

Laboratory proficience tests fall mainly into three categories; identification spot tests, explanations of procedures and organization, and those dealing with skills.

A three-hour examination prepared by the Biology Committee of the College Entrance Examination Board is given in the spring. This examination consists of both objective and essay questions.

TEXT, REFERENCES AND MATERIALS

I. Text

The Biotic World and Man, 1958 - 2nd ed., Milne, Lorus J. and Margery J. Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

Manual in General Biology, 1958, Milne, Lorus J. and Margery J. Prentice Hall, Inc., Englewood Cliffs, New Jersey.

II. Additional References

Principles of Field Biology and Ecology, 1958, Banton, Allen H. and Werner, Wm. E. McGraw-Hill Book Co., New York.

Animal Form and Function, 1954, Breneman, W.R. Ginn and Co., New York.

Biology, 1956, Brown, Relis B. D. C. Heath and Co., Boston.

Classification of Insects, 1954, Brues, C. T., Melander, A. L., and Carpenter, F.M. Museum of Comparative Zoology Bulletin, v. 108, Cambridge, Mass.

Weeds of the North Central States, 1954, Buchsholtz, Grigsby, Lee, Slife, Willard, and Volk. North Central Regional Publication, No. 36, Circular 718, University of Illinois Agriculture Experiment Station, Urbana, Ill.

Animals Without Backbones, 1949, Buchsbaum. University of Chicago Press, Chicago.

How to Know the Immature Insects, 1949, Chu. Wm. Brown Co., Dubuque,Iowa.

Field Guide to Ferns, 1956, Cobb, Boughton. Houghton-Mifflin Co., Boston, Mass.

How to Know the Mosses, 1944, Conrad. Wm. C. Brown Co., Dubuque, Iowa.

How to Know the Fall Flowers, 1948, Cuthbert. Wm. C. Brown Co., Dubuque, Iowa.

Field Book of Common Ferns, 1949, Durand. G.P. Putnam's Sons, New York.

College Botany, 1954, Fuller and Tippo. Henry Holt and Co., New York.

American Spiders, 1949, Gertsch. D. Van Nostrand Co., New York.

Genetics is Easy, 1955, Goldstein. Lantern Press, Inc., New York.

Birds in Kansas, 1945, Goodrich. Kansas State Board of Agriculture, Topeka, Kansas.

New Manual of Botany, 1950, 8th ed., Gray. Am. Book Co., New York.

Handbook of Mammals of Kansas, 1955, Hall, E.R. University of Kansas Museum of Natural History, Lawrence, Kansas.

College Zoology, 1951, Hegner and Stiles, 6th ed. Macmillan Co., NewYork.

How to Know the Protozoa, 1949, Jahn and Jahn. Wm. C. Brown Co., Dubuque, Iowa.

How to Know the Insects, 1947, Jaques. Wm. C. Brown Co., Dubuque, Iowa.

How to Know the Trees, 1940, Jaques. Wm. C. Brown Co., Dubuque, Iowa.

Man and His Biological World, Jean, Harrah, Herman, and Powers, 1952, revised. Ginn and Co., New York.

General Biology, 1956, Johnson, Laubengayer, and DeLanney. Henry Holt and Co., New York.

Protozoology, 1954, Kudo. Charles C. Thomas, Springfield, Illinois.

The Book of Fishes, 1952, National Geographic Society, Washington, D. C

A Guide to the Study of Fresh-Water Biology, 1941, Needham and Needham. Comstock Publishing Associates, Cornell University Press, Ithaca, N.Y.

A Field Guide to Birds, 1939, Peterson. Houghton-Mifflin Co., Boston.

A Field Guide to the Trees and Shrubs, 1957, Petrides. Houghton-Mifflin Co., Boston.

Turtles of United States and Canada, Pope, 1939. Alfred A. Knopf, N. Y.

Botany Principles and Problems, 1955, Sinnoth and Wilson. McGraw-Hill Book Co., New York.

Handbook of Amphibians and Reptiles of Kansas, 1950, Smith, Hobart M. University of Kansas, Museum of Natural History, Lawrence, Kansas.

General Zoology, 1957, Storer and Usinger. McGraw-Hill Book Co., N. Y.

Modern Classification of the Plant Kingdom, 1954, Tippo. Chronica Botanical Co., Waltham, Mass.

Fresh-Water Biology, 1948, Ward and Whipple. John Wiley and Sons, N. Y.

General Biology, 1956, Wells and Wells. McGraw-Hill Book Co., New York.

Biology and Its Relation to Mankind, 1957, Winchester and Kaston. D. Van Nostrand Co., New York.

Zoology, 1955, 2nd ed., Winchester and Lovell. D. Van Nostrand Co., N.Y.

III. Magazines

National Geographic Magazine, National Geographic Society, Washington, D. C.

Nature Magazine, American Nature Association, Washington, D. C.

Science, American Association for the Advancement of Science, Washington, D. C.

Scientific American, Scientific American Inc., New York 36, New York.

IV. Audio-Visual Aids

0-825	Bacteria - Friend and Foe
00-414	Biolgraphy of the Unborn
0-39	Birds of the Dooryard
0-997	Cancer
0-881	Carnivorous Plants
00-384	Cicada - The Insect Methuselah
00-446	Human Heredity
00-419	Crustaceans
00-387	Electric Eel
0-839	Fish Out of Water
00-378	Heart - How it Works
0-195	Honeybee
00-444	Human Body - Circulatory System

00-391	Human Machine
0-238	Life in a Drop of Water
00-357	Look to the Land
00-493	Mitosis and Meiosis
0-969	Protozoa - One-Celled Animals
00-306	Snakes - Friends or Foes
0-872	Wonder Engine of the Body
00-442	Worms
0-947	Your Body During Adolescence

V. Filmstrips

F-655	Bears, Pandas and Racoons
F-1561	Class Insecta
F-660	Crocodiles and Turtles
F-1556	Echinoderms
F-1557	Flatworms
F-661	Lizards of the World
F-658	Mammals, Large Hoofed
F-662	Nonpoisonous Snakes of U. S.
F-657	Primates, Monkeys and Relatives
F-1559	Roundworms
F-659	Rodents
F-664	Snakes Outside of U. S.
F-1560	Sponges and Coelenterates

PROFESSIONAL AIDS

The American Biology Teacher, National Association of Biology Teachers, Interstate Press, Danville, Illinois.

The Science Teacher, National Science Teachers Association, Washington, D. C.

Advanced Placement Program Syllabus, College Entrance Examination Board, N. Y.

BIOLOGY - LIFE SCIENCE

Audio - Visual Instructional Materials

UNIT 1 - Introduction:

00-659	Aristotle and the Scientific Method
0-994	Characteristics of Plants and Animals
00-391	Human Machine
00-242	Introduction to Biology
00-563	Microscopic Life: World of the Invisible
00-651	Worlds of Dr. Vishniac
F-1762	Kinds of Cells
F-1629	Structure of Living Things, Parts I and II
F-1996	World of One-Celled Animals

UNIT 2 - Getting Acquainted with Some Organisms:

0-17	Animal Life
00-639	Animals in Spring
0-875	Animals in Summer
0-593	Animals in Winter
0-19	Animals of the Zoo
00-279	Animals Unlimited
0-486	Ants
0-21	Aphids
00-501	Audubon and the Birds of America
00-338	Balance in Nature
0-879	Balanced Aquarium
0-34	Beach and Sea Animals
00-16	Bear and Its Relatives
0-587	Beaver
0X-75	Beaver Valley
0-35	Beetles
0-38	Birds of Prey
0-39	Birds of the Dooryard
0-826	Birds of the Countryside
0-827	Blind as a Bat
0-24	Butterfly Mystery
0-56	Camouflage in Nature
0-881	Carnivorous Plants
0-779	Cecropia Moth
0-994	Characteristics of Plants and Animals
00-24	Cicada
00-384	Cicada - the Insect Methuselah
0X-139	Coral Wonderland (Australia's Coral Reef)
00-419	Crustaceans
0-93	Deer and Its Relatives
0-106	Dodder - A Parasitic Plant
0-115	Earthworm
00-387	Electric Eel
0-838	Fish Are Interesting
0-1004	Fish Family
0-838	Fish Out of Water

0-597	Five Colorful Birds
0-781	Flight of the Sea Birds
0-141	Flowers at Work
0-163	Fungus Plants
00-45	Grasshopper
0-918	Grasshopper: A Typical Insect
00-424	Gray Gull, the Hunter
0-185	Growth of Flowers
00-49	High Over the Borders
0-195	Honey Bee
0-197	Horse and Its Relatives
00-481	House Fly
00-594	How Animals Help Us
00-534	How Nature Protects Animals
00-331	How to Collect and Preserve Plants
00-590	Insect Foods
0-783	Insects
0-784	Insects are Interesting
0-785	Kangaroos
0-227	Killers of the Insect World
0-235	Leaves
0-736	Life Along the Waterways
0-237	Life Cycle of the Mosquito
0-1034	Life in a Cubic Foot of Air
0-238	Life in a Drop of Water
0-891	Life in the Desert
0-892	Life in the Forest
0-893	Life in the Grasslands
0-240	Life of the Ant
00-597	Life of the Molds
0-236	Life on a Dead Tree
0-850	Mammals Are Interesting
0-255	Mammals of the Countryside
0-256	Mammals of the Rocky Mountains
0-257	Mammals of the Western Plains
00-563	Microscopic Life: World of the Invisible
00-145	Migration of Birds: Canada Goose
00-397	Mollusks
0-273	Monarch Butterfly Story
0-275	Mosquito - Public Enemy
0-276	Moths
0X-188	Orders of Insects
0-295	Our Animal Neighbors
0-551	Plant Growth
0-317	Plant Traps: Insect Catchers of Bog Jungle
0-896	Plant Life at Work
0-326	Pond Insects
00-407	Reptiles
0-349	Roadrunner Battles Rattlesnake
0-351	Robin
0-352	Robin Redbreast
0-610	Ruby-Throated Hummingbird
00-635	Science of the Sea
0X-191	Seal Island
0-361	Seed Dispersal
0-369	Shell Fishing
00-568	Simple Plants: Algae and Fungi
00-595	How Plants Help Us

00-569	Simple Plants: Bacteria
0-556	Snakes
0-377	Snakes Are Interesting
00- 306	Snakes: Friend or Foe
0-378	Snapping Turtle
00-438	Spider Engineer
0-392	Spiders
00-365	Spring Comes to a Pond
0-402	Sunfish
0-419	Thrushes and Relatives
0-421	Tiny Water Animals
0-443	Water Birds
00-629	What Plants Need for Growth
0-510	Wool
00-526	World in a Marsh
00-368	World of Little Things
00-442	Worms - Annelida
0-511	Zoo

Filmstrips (In ordering, please list catalog number and title - not series title)

African Lion Series: (Walt Disney)

F-1274	Antelopes and Smaller African Animals
F-1275	Elephants in Africa
F-1276	King of Beasts
F-1277	King's Realm
F-1278	Larger Animals of Africa
F-1279	Life and Death on the African Plain
F-447	American Birds (Kit of 4 with guide)
F-448	American Insects (Kit of 4 with guide)
F-1169	American Trees (Kit of 4 with guide)
F-449	American Wild Flowers (Kit of 4 filmstrips, guide)
F-1970	Animal Babies
F-1971	Animals of Sea and Shore

Arctic Wilderness Series: (Walt Disney)

F-1428	Arctic Foxes and Wolves
F-1429	Birds of the Northland
F-1430	Marine Mammals of the Northland
F-1431	Northland
F-1432	Rodents of the Northland
F-1433	Wolverines and Weasels of the Northland
F-2099	Audubon's Animals (with guide)
F-2100	Audubon's Birds (with guide)
F-1862	Backyard Insects

Basic Biology Series:

F-975	What Makes Up a Flower Family
F-976	Structure of Flower Plants
F-977	Identifying Parasitic Plants
F-978	Plant and Animal Life Under the Sea
F-979	Kinds of Plants
F-980	Life of a June Bug and Cicada

Basic Nature Study Series:

F-1006	How to Recognize Birds
F-1007	How Birds Are Fitted for Their Work
F-1008	How Insects Live and Grow
F-1009	How to Identify Moths and Butterflies
F-1010	Life Cycle of the Monarch Butterfly
F-1011	Life of the Honey Bee
F-1012	Frogs, Toads, and Turtles, and How They Grow
F-1013	Snakes and Lizards You Should Know
F-1014	Identifying Common Trees
F-1015	How Flowering Plants Grow and Reproduce
F-983	Birds of Our Ponds and Marshes
F-984	Birds of the Ocean
F-985	Birds that Live Near People
F-986	Birds of the Forest
F-1972	Birds We Know
F-1765	How Hormones Regulate Plant Growth
F-1973	Insects

Living Desert Series: (Walt Disney)

F-1170	Great American Desert
F-1171	Mammals of the Desert
F-1172	Plant Life of the Desert
F-1173	Reptiles of the Desert
F-1174	Small Creatures of the Desert
F-1175	Survival in the Desert

Mammals Series:

F-655	Bears, Pandas, Raccoons
F-656	Cats and Dogs
F-657	Primates: Monkeys and Their Relatives
F-658	Large-Hoofed Mammals
F-659	Rodents
F-987	Migration of Birds
F-1761	Photosynthesis
F-1974	Plants We Know

Reptiles Series:

F-660	Crocodilians and Turtles
F-661	Lizards of the World
F-662	Non-Poisonous Snakes of the United States
F-663	Poisonous Snakes of the United States
F-664	Snakes Outside of the United States
F-1377	Roll Call of the Animals
F-1500	Roll Call of the Plants

Seed Plants Series:

F-299	Green Plants
F-300	Seeds
F-301	Roots
F-302	Stems
F-303	Leaves
F-304	Fruits and Flowers

F-1975	Trees
F- 967	Understanding Snakes

Vanishing Prairie Series: (Walt Disney)

F-1280	American Buffalo
F-1281	American Prairie
F-1282	Birds of the Prairie
F-1283	Coyotes and Other Prairie Animals
F-1284	Mountain Lion
F-1285	Prairie Dogs
F-276	Waterway Birds
F-1379	Ways of Starting New Plants

Wonderland of Science Series:

F-1027	Helpful Plants and Animals
F-1028	Protecting Plants and Animals
F-1037	Plant Families
F-1038	Growing New Plants

Zoology Set I:

F-1556	Echinoderms
F-1557	Flatworms
F-1558	Protozoans
F-1559	Roundworms
F-1560	Sponges and Coelenterates

Zoology Set II:

F-1561	Class Insecta
F-1562	Chordates
F-1563	Crustaceans
F-1564	Mollusks
F-1565	Segmented Worms

UNIT 3 - Food:

Sound Motion Pictures:

0-49	Bread
0-798	Butter Is Made This Way
0-583	Cheese and Cheese Making
0-882	Eat for Health
0-143	Foods and Nutrition
0-155	Fundamentals of Diet
0-183	Ground Water
0-927	Meat from Range to Market
0-266	Milk
0-270	Modern Eden
0-337	Production of Foods
0-2	Rice in Today's World
0-385	Something You Didn't Eat
00-117	Story of Bananas
00-304	Story of Rice

00-120	Sugar Cane
00-311	Understanding Vitamins
0-807	Uncle Jim's Dairy Farm
00-135	Vitamins A, B, C, D
0-444	Water Cycle
0-769	Water We Drink
0-355	We Get Food From Plants and Animals
0-462	Whenever You Eat
0-469	Yes, Bananas!
00-473	Your Daily Bread
00-370	Your Food

Filmstrips: (Order by number and title, not series title)

F-39	Digestion of Foods
F-471	Eating Right Kind of Food
F-1526	Enzymes, Spark Plugs of Life (with guide)
F-47	Essentials of Diet
F-41	Food and Nutrition
F-1469	Food for Life (Guide)
F-223	Food from the Sun
F-48	How Food Is Digested
F-1763	How Vitamins Help Man
F-1090	Keeping Foods Safe to Eat
F-670	Making Water Safe to Drink
F-1863	Mushrooms
F-49	Nutrients in Food
F-1181	Safeguarding Foods
F-667	Testing Foods and Nutrients
F-1419	Water Purification
F-1183	Water We Drink
F-668	What Is Digestion
F-312	Why Does Food Spoil

Wonderland of Science Series:

F-1021	Exploring Water Sources
F-1022	Purifying Drinking Water
F-1025	Investigating Nutrients
F-1026	Using Nutrients

UNIT 4 - Body Systems of Organs:

Sound Motion Pictures:

0-13	Alimentary Tract
0-655	Care of Hair and Nails
0-59	Care of the Feet
0-526	Care of the Skin
0-99	Digestion of Foods
0-494	Ears and Hearing
0-123	Endocrine Glands
0-1035	Exploring Your Growth
0-1001	Eyes: Their Structure and Care
0-130	Eyes and Their Care
00-655	Flow of Life (Horizons of Science series)

0-150	Frog
00-301	Fundamentals of Nervous System
0-1000	Healthy Skin
0-190	Heart and Circulation
0-886	Heart Disease: Its Major Causes
00-378	Heart: How It Works
0-403	Heart, Lungs and Circulation
OX-112	Hemo the Magnificent, Parts I and II
00-444	Human Body - Its Circulatory System
00-503	Human Body - Its Digestive System
00-661	Human Body - The Excretory System
00-559	Human Body - The Nervous System
0-888	Human Brain
00-391	Human Machine
0-926	Learning About Your Nose
0-262	Mechanism of Breathing
0-284	Nervous System
0-895	Nose
0-478	Nose, Throat and Ears
0-613	See Better: Healthy Eyes
0-712	Skeleton
0-974	Spinal Column
0-411	Teeth: Development and Care
0-793	Teeth Are to Keep
0-872	Wonder Engine of the Body
0-467	Work of the Kidneys
0-527	Cell Division
0-1074	Willie and the Mouse

__Filmstrips__: (Order by number and title, do NOT order by series title)

F-2012	Body Machine: Muscular System
F-38	Care of the Feet
F-40	Eyes and Their Care
F-42	Heart and Circulation

__Introductory__ __Physiology__ __Series__:

F-487	Bones and Muscles
F-488	Circulatory System
F-489	Digestive System
F-490	Ears
F-491	Eyes
F-492	Nervous System
F-493	Respiratory System
F-494	Skin, Hair and Nails
F-495	Teeth

F-1762	Kinds of Cells
F-1629	Structure of Living Things, Parts I and II
F-44	Teeth

UNIT 5 - Behavior

Sound Motion Pictures:

00-416	Control Your Emotions
00-301	Fundamentals of the Nervous System
0-344	Reactions in Plants and Animals

Filmstrips:

F-1630	Behavior of Living Things
F-233	Emotional Health
F-1998	Man's Senses in Action
F-1099	What Is Behavior

UNIT 6 - Health

Sound Motion Pictures

00-151	Alcohol and the Human Body
00-2	Accent on Health
0-998	Allergies
0-487	Attitudes and Health
0-825	Bacteria - Friend and Foe
0-42	Body Defenses Against Disease
00-148	Body Fights Bacteria
0-997	Cancer
0-84	Control of Body Temperature
0-533	Dental Health: How and Why
0-94	Defending the City's Health
0-801	Defense Against Invasion
OX-60	. . .Earth Shall Give Back Life
0-726	First Aid Fundamentals
0-137	First Aid on the Spot
0-1054	Health Heroes: Battle Against Disease
0-887	How Our Bodies Fight Disease
0-208	Immunization
00-487	Inside Story (Tuberculosis)
OX-25	Life Stream
00-538	Mental Health
00-300	Obesity
0-327	Posture and Exercise
0-999	Rest and Health
0-554	Save Those Teeth
0-397	Story of Dr. Jenner
00-308	Story of Louis Pasteur
00-410	Tobacco and the Human Body
0-435	Water for the Community
0-1086	Your Ears
0-1087	Your Eyes
0-947	Your Body During Adolescence

Filmstrips: (Order by catalog number and title, not by title of a series)

F-1286	Adventures in Seeing

Alcohol and Narcotics Series:

F-750	Alcohol, Parts I and II
F-751	Narcotics, Part I and II
F-1375	Antibiotics - Disease Fighting Champions
F-309	Bacteria - Good and Bad
F-29	Billy Meets Tommy Tooth
F-37	Body Defenses Against Disease
F-231	Body Care and Grooming
F-232	Body Fights Bacteria
F-1371	Brush Up on Your Teeth
F-1748	Chemical Lab in Your Body
F-1180	Diseases
F-665	Excretion
F-1634	Factors in Health and Disease

First Aid Series;

F-472	Artificial Respiration
F-473	Bleeding and Shock
F-474	Bone, Muscle and Joint Injuries
F-475	Common Emergencies
F-476	Dressings and Bandages
F-477	Injuries Caused by Heat and Cold
F-478	Transportation of the Injured
F-479	Wounds
F-480	Your Responsibilities

Health Adventures Series:

F-753	Your Teeth and Their Care
F-754	Your Eyes at Work
F-755	How Your Ears Work
F-756	Your Nose and Throat
F-757	Your Skin and Its Care
F-758	Your Food and Digestion
F-759	Your Bones and Muscles
F-760	Your Heart and Lungs
F-761	Rest and Sleep

Health Heroes Series:

F-30	Edward Jenner and Story of Smallpox Vaccination
F-31	Edward Livingston Trudeau and Crusade Against T.B.
F-33	Louis Pasteur and Germ Theory of Infection
F-34	Madame Curie and Story of Radium
F-35	Robert Koch and Discovery of Tubercle Bacillus
F-36	Walter Reed and Conquest of Yellow Fever
F-1376	How Hormones Control the Body
F-282	How the Heart Works
F-1860	How Your Body Fights Disease
F-666	Human Respiration
F-982	Individuals Change
F-1098	Nervous System
F-235	Nose, Throat and Ears
F-1378	Salk Vaccine
F-762	Sewage Disposal
F-1182	Sanitation

F-2014	Virus Mystery
F-1470	War Against Cancer
F-1380	Work of Louis Pasteur

Wonderland of Science Series:

F-1039	Radioactive Atoms
F-1040	Using Isotopes to Improve Health

Sound Motion Pictures

0-516	Arctic Borderlands in Winter
0-833	Development of Chick Embryo
00-163	Human Growth
00-446	Human Heredity
00-486	In the Beginning
00-161	Osmosis
OX-125	Nature's Half Acre
0-969	Protozoa - One-celled Animals
0-347	Reproduction Among Mammals
00-567	Reproduction in Plants
0-353	Roots of Plants
0-396	Story of Dr. Carver
OX-198	Thread of Life, Parts I and II

Filmstrips

F-1626	Energy and Life
F-1627	Fundamental Life Process
F-981	Heredity
F-234	Human Reproduction
F-1628	Interdependence of Living Things
F-43	Reproduction Among Mammals
F-327	Flowers and Plant Reproduction

UNIT 8 - Pageant of Life

Sound Motion Pictures

0-908	Animals at Work in Nature
00-612	Animals of Prehistoric America
OX-5	Alaska's Silver Millions
0-778	Carbon Fourteen
00-104	Primitive Man in Our World
0-933	Prehistoric Times: World Before Man

Filmstrips: (Order by catalog number and title only, do not order by series title)

F-1631	Effects of Environment
F-1633	Factors in Survival
F-1636	Descent with Change
F-1632	Heredity and Enviroment
F-1751	Man from Dim Past
F-1635	Origins of Living Things

Prehistoric Life Series

F-867	Age of Mammals
F-868	Coming of Reptiles
F-869	Discovering Fossils
F-870	Rise of Dinosaurs
F-871	Story Fossils Tell
F-872	Triumph of Dinosaurs
F-1435	Story of Fossils

UNIT 10 - Some Biological Problems of Man

Sound Motion Pictures:

0-5	Agriculture
0-773	Atom and Agriculture
0-774	Atom and Biological Science
0-775	Atom and Medicine
0-719	Atom and Industry
0-776	Atom Smashers
0-777	Atomic Radiation
00-338	Balance in Nature
00-282	Cattle and the Cornbelt
0-82	Conservation of Natural Resources
0-83	Consumption of Foods
0-85	Corn Farmer
0-145	Forestry and Forest Industries
00-357	Look to the Land
0-293	Orange Grower
00-606	Our Part in Conservation
0-505	Our Soil Resources
0-302	Paper
0-331	Poultry Raising
0X-194	Rainbow Valley: Story of a Forest Ranger
0-357	Science and Agriculture
0X-35	Story of Canadian Pine
0-400	Strength of the Hills
0-425	Truck Farmer
00-77	Wheat Farmer
00-133	Wild Life and the Human Touch
00-315	Yours Is the Land

Filmstrips:

F-1905	Aiding Wild Life of Field and Stream
F-1906	Aiding Wild Life: Woodlot and Forest
F-683	Animal Life and the Soil
F-1434	Combatting Insect Pests
F-1381	Conserving Our Soil and Water
F-684	How Long Will It Last
F-685	How Man Conserves the Soil
F-686	How Man Uses the Soil
F-687	How Soil is Formed
F-688	Minerals in the Soil
F-689	Plant Life and the Soil

F-1904	Problems of Wild Life Today
F-1003	Saving the Soil
F-1004	Using Our Forests Wisely
F-690	Water and the Soil

BIOLOGY -- GENERAL

In addition to the films and filmstrips listed under Audio-Visual Materials in the BIOLOGY: LIFE SCIENCE section, the following materials are available:

Sound Motion Pictures:

0-995	Asexual Reproduction
00-494	Basic Nature of Sexual Reproduction
0X-9	Before the Doctor Comes
00-414	Biography of the Unborn
00-153	Drunk Driving
0-193	Heredity
0X-20	Heritage We Guard
00-52	Human Reproduction
0-543	Introduction to Chemistry
0-544	Introduction to Physics
00-493	Mitosis and Meiosis
0X-188	Orders of Insects
00-166	Pharmaceutical Products
00-404	Preface to Chemistry
00-405	Preface to Physics
00-461	Rabies
00-602	Rabies
0-711	Scientific Method
0-457	What is Science
0-945	What Study Science

NOTE: As of the writing of this guide, the Audio-Visual Department is considering the purchase of the A. I. B. S. series of Biology films, produced by McGraw-Hill Book Company, and the Biology Series produced by Encyclopedia Britannica Films. As soon as these materials are available, the Audio-Visual Department will issue a listing of these films

BIOLOGY: ADVANCED PLACEMENT

Sound Motion Pictures:

(* = Films recommended for grades 10 to 14. Other films listed are recommended for junior high school through college level. For additional supplementary materials, see listings under section on BIOLOGY: LIFE SCIENCE)

*00-151	Alcohol and the Human Body
*0-13	Alimentary Tract
0-998	Allergies
0-17	Animal Life
00-659	Aristotie and Scientific Method
*0-995	Asexual Reproduction
0-773	Atom and Agriculture
0-774	Atom and Biological Science
0-719	Atom and Industry
0-775	Atom and Medicine
0-776	Atom Smashers
0-777	Atomic Radiation
*0-825	Bacteria: Friend and Foe
00-338	Balance in Nature
*00-494	Basic Nature of Sexual Reproduction
*00-414	Biography of the Unborn
0-42	Body Defenses Against Disease
0-997	Cancer
0-778	Carbon Fourteen
0-59	Care of the Feet
0-881	Carnivorous Plants
0-779	Cecropia Moth
0-527	Cell Division
0-994	Characterisitcs of Plants and Animals
00-24	Cicada
00-384	Cicada: Insect Methuselah
0-82	Conservation of Natural Resources
0-83	Consumption of Foods
*0-84	Control of Body Temperature
00-419	Crustacans
*0-833	Development of Chick Embryo
*0-99	Digestion of Foods
*0-106	Dodder, Parasitic Plant
0-494	Ears and Hearing
0X-60	. . .Earth Shall Give Back Life
0-115	Earthworm
00-387	Electric Eel
*0-123	Endocrine Glands
*0-130	Eyes and Their Care
0-1001	Eyes: Structure and Care
00-655	Flow of Life
*0-143	Foods and Nutrition
*0-145	Forestry and Forest Industries
00-301	Fundamentals of the Nervous System
*00-45	Grasshopper
*0-190	Heart and Circulation
*0-886	Heart Disease: Major Causes
00-378	Heart: How It Workd
0X-112	Hemo, the Magnificent .Parts I and II
*0-193	Heredity
0X-20	Heritage We Guard
00-331	How to Collect and Preserve Plants
00-444	Human Body: Circulatory System
00-503	Human Body: Digestive System
00-661	Human Body: Excretory System
00-559	Human Body: Nervous System

0-888	Human Brain
00-163	Human Growth
*00-446	Human Heredity
00-391	Human Machine
*00-52	Human Reproduction
*0-208	Immunization
*00-486	In the Beginning
00-590	Insect Foods
0-783	Insects
0-784	Insects Are Interesting
00-487	Inside Story (Tuberculosis)
00-242	Introduction to Biology
*0-237	Life Cycle of Mosquito
0-1034	Life in a Cubic Foot of Air
0-238	Life in a Drop of Water
00-597	Life of the Molds
*0-262	Mechanism of Breathing
00-538	Mental Health
*00-493	Mitosis and Meiosis
00-397	Mollusks
0-275	Mosquito - Public Enemy
0X-127	Nature's Half Acre
*0-284	Nervous System
0-478	Nose, Throat and Ears
*00-300	Obesity
*0X-188	Orders of Insects
00-161	Osmosis
0-505	Our Soil Resources
*0-327	Posture and Exercise
*0-328	Posture and Locomotion
*0-969	Protozoa - One-Celled Animals
0-344	Reactions in Plants and Animals
*0-347	Reproduction Among Mammals
00-567	Reproduction in Plants
00-407	Reptiles
0-357	Science and Agriculture
00-635	Science of the Sea
00-568	Simple Plants: Algae and Fungi
00-569	Simple Plants: Bacteria
*0-712	Skeleton
00-438	Spider Engineer
*0-974	Spinal Column
0-397	Story of Dr. Jenner
00-308	Story of Louis Pasteur
0-400	Strength of the Hills
*0X-198	Thread of Life (Parts I and II)
00-410	Tobacco and the Human Body
00-311	Understanding Vitamins
0-1074	Willie and the Mouse
0-872	Wonder Engine of the Body
*0-467	Work of the Kidneys
00-651	Worlds of Dr. Vishniac
00-368	World of Little Things
00-442	Worms - Annelida
0-947	Your Body During Adolescence
*00-232	Alcoholism
*00-148	Body Fights Bacteria
0-73	City Water Supply

*00-29	Dehydration
0-726	First Aid Fundamentals
0-137	First Aid on the Spot
*00-180	It's the Brain that Counts
*0-323	Pneumonia
0-711	Scientific Method
*00-340	That Babies May Live
*0-426	Tuberculosis

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